FRIDAY, JUNE 11, 1897.

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## Master Car Builders' Reports.

We give below abstracts of the reports presented by the Master Car Builders' Committees, at the Old Point Comfort convention:

### AUTOMATIC COUPLERS.

Your committee finds a tendency to depart from the standard design by extending the square section throughout the length of shank. The smallest cross-sections of shanks vary from 6.6 to 13.8 sq. in. of metal, while that of the Association's standard is 8.59 sq. in The percentage of breakage of those with the least cross-section has been shown to be so small (about .08) that this cannot be offered as an argument in support of adding metal to make a square shank, nor to justify the addition of weight in internal ribs, but does establish the advantage in weight to be gained by the use of the best materials in the manufacture of couplers. The committee would therefore recommend:

(1) That the design of M. C. B. coupler shank, adopted as standard in 1893, be continued without change as the standard of the association.

It is considered impracticable to drill the rivet holes through coupler shanks; and on account of the variations due to cored holes we think the lips on the ends of straps should remain, but to insure an easy bend there should be added a dimension showing radius of ¼ inch on inside at back corners. The committee would therefore recommend:

(2) That the design of pocket strap included in the recommended practices of the association and shown in Sheet B of Proceedings for 1896, with a radius of ¼ inch at inside back corners, be made a standard of the association.

The members of this committee are Messrs. C. M. Mendenhall, A. E. Mitchell, W. Garstang, W. H. Thomas, T. G. Duncan, J. M. McBeth, J. T. Chamberlain.

### STANDARDS AND RECOMMENDED PRACTICE.

*Journal Box and Details for Journal 4¼ by 8 Inches.*—While the general sentiment is in favor of perpetuating the use of the top hinged lid as standard, yet the detail arrangement of the lid is not entirely satisfactory: it is reported that dust enters journal boxes either through the openings at the hinge or at the edges of the lid. The committee suggests the appointment of a special committee to report on the improvement and perfection of the standard top hinged lid.

The illustrations of the two standard journal boxes, as given on sheets 1, 2, 4 and 5, show forms of journal boxes adapted only for use in those types of trucks which are commonly used with freight equipment cars. As the use of these journal boxes in other forms of truck (whether in passenger or freight service) involving the pedestal principle is increasing, the committee further advises the appointment of a special committee to recommend forms or modifications of these standard journal boxes adapted for use in such pedestals.

*Brake Head and Shoe.*—The attention of the committee has been called to the fact that in the design of brakeshoe and head, as given by Sheet 8, there is a clearance of ⅛ in. on either side as between the central lug of the brakeshoe and the adjacent lugs of the brakehead, with similar clearances at either end of the brakeshoe. It is not known whether these clearances are excessive or not. It is suggested that members should watch this feature of the design, and should be prepared to respond to the inquiries of the committee before the convention of 1898.

*Air-Brakes, General Arrangement and Details.*—The committee advises that a note be added to Sheet 9 (which shows a dummy coupling on end sill of car), somewhat as follows: "The use of the dummy coupling is optional."

The use of wrought-iron bottom connectors seems to be increasing, and to prevent the use of such of insufficient strength, it is suggested that the note on Sheet 9 now reading "If made of material other than malleable iron must be of equal strength," should have added to it "and if made of round iron or steel must be not less than 1⅝ in. diameter."

*Pedestal.*—Several members have suggested that the top flange ought to be arranged for three horizontal bolts instead of two; also that the bottom of the pedestal should be rearranged to take a tie bar 3 in. wide, instead of 2½ in. wide as now. The committee has no suggestions to make, but calls attention to the fact that a special committee has to report on "Passenger Car Pedestal and Journal Box for Journal 4½×8 in.," and that the report of that committee may possibly suggest a line of action for considering the revision of the design of the present standard pedestal.

*Automatic Coupler.*—The design does not define the length or spread of the guard arm; the committee suggests the appointment of a special committee to consider this matter and to report at the convention of 1898.

*Wheel Flange Thickness Gages for New Wheels.*—The committee has no recommendations to make, but calls attention to the fact that the paper read by Mr. Tatnall (of the Pennsylvania Railroad), at a recent meeting of the New York Railroad Club, throws some new light on this matter.

*Screw Threads, Bolt Heads and Nuts.*—The diagrams (on page 490 of the Proceedings of 1896) show hexagon heads and nuts only. The diagrams illustrating the standards of the Master Mechanics' Association (see page 339 of their Proceedings for 1896) also show hexagon heads and nuts only; the heading of one of the columns of the table of dimensions indicates, however, that when square heads or nuts are used, the side of the square is to be the same as the short diameter of the hexagon head or nut. Bolt manufacturers are furnishing railroad companies with bolts having heads of smaller dimensions, and it is probable that nut manufacturers are furnishing railroad companies with square nuts of dimensions which do not conform exactly to the standards of the association. The committee advises the appointment of a special committee to review this matter, this committee to work jointly with a similar committee of the Master Mechanics' Association, these two committees to make a joint report at the convention of 1898.

*Axle and Journal Box for Cars of 80,000 lbs. Capacity.*—The committee calls attention to the fact that the journal box and contained parts for cars of 80,000 lbs. capacity were adopted as recommended practice after the convention of 1896, and with the understanding that they should be subject to adoption as standards of the association at its pleasure later on. The committee calls particular attention to the fact that Plate G shows the Fletcher side hinged lid used in connection with this journal box, whereas the Committee on Standards has stated that the general sentiment of the members is to adhere to the use of the top hinged lid on the two journal boxes which are already standards of the association.

*Journal Bearing and Wedge Gages.*—Attention is called to the fact that Sheet 3 shows a radius of bore of bearing for journal 3¾ × 7 as being $1\frac{29}{32}$ in. (corresponding to diameter of $3\frac{13}{16}$ in. for a journal 3¾ in.) while Plate C shows radius of bearing bore gage for journal 3¾ × 7 as being $1\frac{15}{16}$ in. (corresponding to a diameter of 3⅞ in. for journal 3¾ in.); also, that Sheet 6 shows radius of bore of bearing for journal 4¼ × 8 as being $2\frac{5}{32}$ in. (corresponding to a diameter of $4\frac{5}{16}$ in. for a journal 4¼ in. diameter), while Sheet C shows the radius of the bearing bore gage for journal 4¼ × 8 in. as being $2\frac{3}{16}$ in. (corresponding to a diameter of 4⅜ in. for a journal 4¼ in. diameter). It is believed that the practice shown by Sheet C, and providing that the diameter of the bore of the bearing should be ⅛ in. greater than the diameter of the journal on which the bearing is to be used, is the practice. The committee, therefore, advises that the radius dimensions of bore of bearings on Sheets 3 and 6 should be modified to correspond with the radius dimensions of the bearing bore gages shown by Sheet C.

*Dummy Coupling and Hook.*—The committee recommends that a note should be added to Sheet M. C. B. —C (which shows the dummy coupling in detail), reading somewhat as follows: "The use of dummy coupling is optional."

*Air-Brake and Signal Instructions.*—The committee calls attention to the fact that a special committee on Air-Brake and Signal Instructions," working jointly with a similar committee from the Master Mechanics Association, is to report on a revision of these instructions. The committee advises that the revision as accepted by the two associations should be adopted by the Master Car Builders' Association as recommended practice.

Finally, the committee calls attention to the fact that it has above recommended the appointment of special committees (to report at the convention of 1898) as follows:

1. On the improvement and perfection of the top hinged lid, so that it may completely exclude dust from journal boxes.

2. On the modification of the standard journal boxes, to adapt them for use in trucks (whether for passenger or freight cars) involving the use of pedestals.

3. To consider the question of defining the length and spread of the guard arm of the automatic coupler.

4. To consider (jointly with a committee of the Master Mechanics' Association) whether the standards of the associations in the matter of square bolt heads and nuts ought in any way to be modified.

The members of this committee are: Messrs. R. H. Soule, A. M. Waitt, G. L. Potter.

### TRAINS PARTING.

At the 1896 convention it was shown that there is a great deal of trouble all over the country from trains parting when equipped with M. C. B. couplers, as well as with link and pin couplers. The committee appointed to investigate this subject sent circulars to all representative members asking that a detailed record be kept of all cases of trains parting for about three months. Only 31 roads collected such data and the results of their reports are given in tabular form below.

The data obtained from replies to our circular of inquiry, together with an extended observation at home and abroad on our railroads, has convinced your committee that some radical steps must be taken to improve and maintain in proper shape the couplers, draft rigging and attachments to same on our cars.

A summary of the facts obtained from the thirty-one railway companies, representing 37,490 miles of track and 376,010 cars, shows in an average period of 105 days the alarmingly large total of 5,775 cases of trains parting, 103 of which were accompanied by serious damage, and in some cases loss of life. This shows an average of 55 cases of trains parting per day, and this on only a very small percentage of the railway mileage of the United States. Of the above cases, fortunately most of them occurred at speeds of under 20 miles per hour, and many of them occurred just as the trains were pulling out after having slackened up.

On one road where an exceedingly rigid investigation of every case of train parting has for some time been made, it was found that only 0.78, of one per cent. of the cases occurred in connection with the application of air brakes, and this experience seems to be substantiated by nearly all the reports.

The following table, tabulated from the replies to our circular of inquiry, will give a good idea of the comparative frequency of trains parting from different causes:

| | |
|---|---|
| Total number of cases in 105 days | 5,775 |
| Average number of cases per day for 31 roads | 55 |

Number of cases due to—

| | | Per cent. |
|---|---|---|
| Broken links and pins | 1,517 | 26.27 |
| Link and pin drawbars in addition to above | 1,081 | 18.72 |
| Total due to use of link and pin drawbars | 2,598 | 44.99 |
| Broken coupler spindles | 708 | 12.26 |
| Broken coupler pockets | 86 | 1.49 |
| Defective draft rigging | 228 | 3.94 |
| Failure or defects in M. C. B couplers or their attachments | 2,155 | 37.32 |
| Total | 5,775 | |

In connection with the M. C. B. couplers and attachments which caused cases of trains parting, the details are as follows:

Number of cases due to—

| | | Per cent. |
|---|---|---|
| Worn knuckles | 195 | 9.05 |
| Broken or defective locks | 886 | 41.11 |
| Excessive amount of slack in draft rigging | 672 | 31.13 |
| Improper adjustment of uncoupling attachments | 234 | 10.86 |
| Other miscellaneous causes | 168 | 7.79 |
| Total | 2,155 | |

From the figures collected the committee feels justified in saying that links and pins should be got rid of with all possible haste.

Further it is seen that 708 coupler spindles broke, causing trains to part, while there were only 86 similar cases from broken pockets. The committee condemns the use of spindles in new couplers hereafter, and recommends that the association put itself clearly on record against the continuance of the use of spindle rear end attachments and in favor of the general use of pocket attachments.

We notice in connection with M. C. B. couplers that have caused trains to part, that 906 cases, or 42.04 per cent. have occurred from excessive slack in the draft rigging or improper adjustment of the uncoupling attachments.

Excessive slack in draft gear must be overcome by the exercising of greater care in maintaining draft rigging on cars in first-class condition, promptly replacing broken springs, bent followers, springs that have a considerable permanent set, and preventing the use of short springs. It should be considered a defect rendering a car unsafe to run if it has one inch or more play in the draft rigging, so that by the hand the drawbar can be pushed back or pulled out one inch or more. It should also be considered that a car is in improper condition to run when the uncoupling attachments are so arranged that in their released position there is less than two inches slack in the chain connection between the lock and the arm of the uncoupling lever. It is true that a very large percentage of cars running have a less amount of slack in the uncoupling chain. This, in connection with the large number of trains parting, gives a most urgent reason for having a safe limit in connection with the slack in our uncoupling attachments, and your committee would impress upon the representatives of every road in the association the importance of requiring a proper adjustment of the uncoupling attachments and

draft rigging on their cars in accordance with the preceding suggestions.

It is noticed that on many cars the end of the lifting arm of the uncoupling lever does not extend out as far as the center of the lock or lock pin; in good practice this should extend a little beyond the center, and attention to this point would materially improve the foundation uncoupling rigging on our freight equipment. In this connection your committee would urge the necessity of inventive genius in designing a simple uncoupling device so constructed that it will not lift the lock and uncouple the car until the coupler has been pulled out three or four inches from its normal position. Such a device would be very beneficial in overcoming a large number of cases of uncoupling due to improper adjustment of uncoupling attachments and excessive slack in draft gear.

The second largest source of trains parting in connection with M. C. B. couplers is due to broken or defective locks; this cause accounts for 886 cases, or 41.11 per cent. The locks now in use in most of the M. C. B. couplers are not all that they should be. Many of them will creep up by the motion of the car; many of them, dependent upon gravity, are lifted from their proper position by sudden blows. These and other defects which have developed in the large majority of locking devices, warrant the committee in stating that it believes it necessary that coupler locks should be provided with a positive lock, in other words, that there should be a lock to a lock.

The preceding table shows that 195 cases, or 9.05 per cent. of all cases of uncoupling of M. C. B. couplers were due to worn knuckles. Your committee would recommend that during the coming year an investigation be made, by a committee appointed for that purpose, as to the limit of safe wear that can be allowed in knuckles and couplers, with a view of recommending to the association some simple and practical method for inspectors and others to use in determining when M. C. B. couplers or knuckles have become worn or distorted beyond the safe service limit.

In conclusion, the committee would call attention to 168 cases, or 7.79 per cent. of uncoupling between M. C. B. couplers due to miscellaneous causes Most of them can be assigned to broken couplers or knuckles. By the Rules of Interchange and the decisions of the Arbitration Committee, it has been declared that M. C. B. knuckles and couplers can be broken without any unusual rough handling. As the breakage of an M. C. B. coupler represents a loss of from $5 to $8, it behooves railroad companies to protect themselves as far as possible against unnecessary damage of this kind, not only from the standpoint of doing so to prevent cases of trains parting, but from the standpoint of the cost of renewing such couplers when they are broken.

And in this connection your committee would recommend for the consideration of the roads representing the association, the application to their cars of either rigid or, preferably, spring buffer blocks.

The members of this committee are: Messrs. A. M. Waitt, W. Lavery, F. H. Soule, D. Hawksworth, B. E. Thomson.

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STEEL UNDERFRAMING FOR FREIGHT CARS.

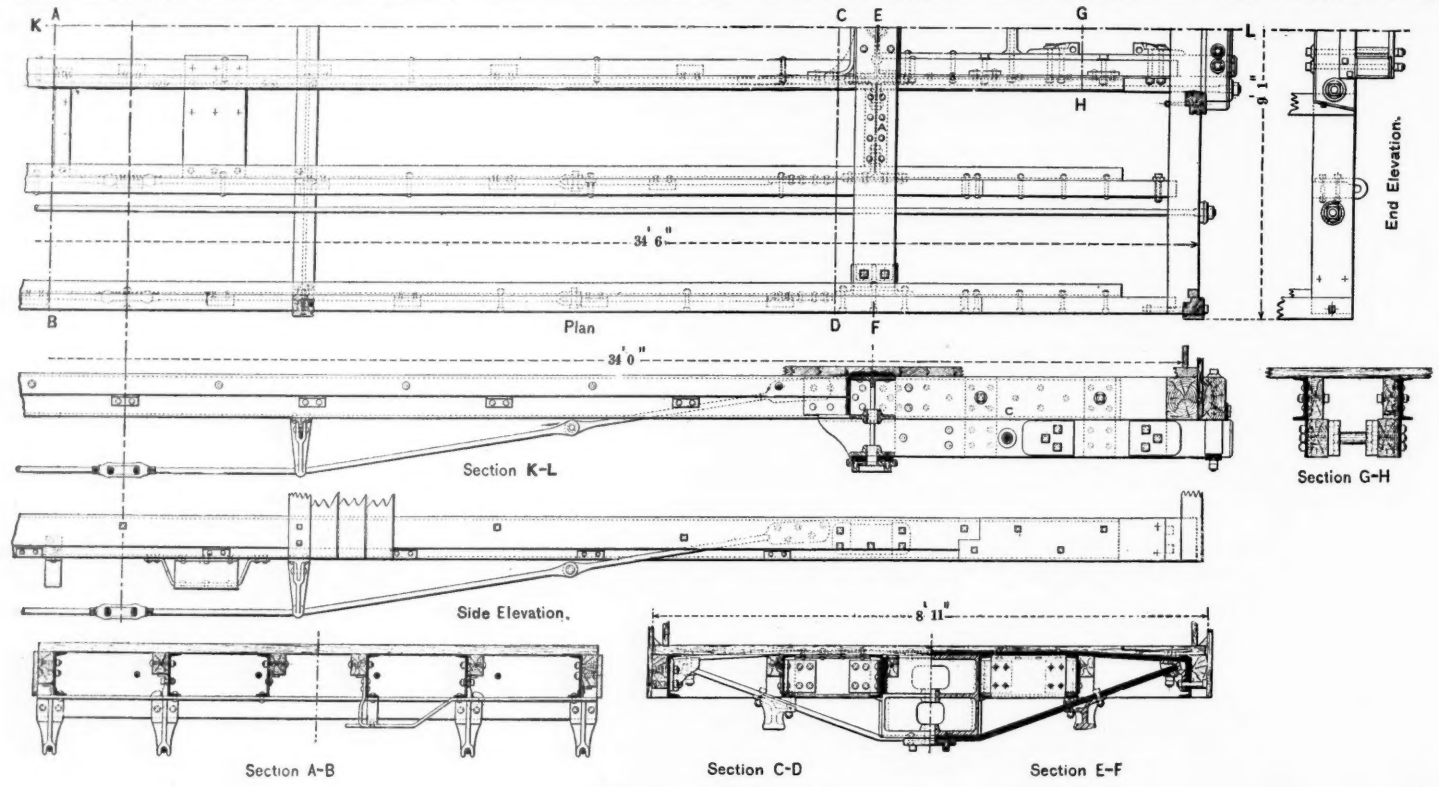
[In the *Railroad Gazette* of Jan. 22, page 63, appeared a report showing very fully the vote on dimensions of a standard freight car, as collected by Mr. Sanderson for this committee. With that report appeared also considerable discussion of the various dimensions and the reasons for preference given to one or the other of them. Therefore we do not reprint from the report now submitted to the convention the diagram showing the vote. —EDITOR.]

The members of the committee of five appointed to prepare individual designs for steel underframing for freight cars decided to ascertain by direct inquiry from the leading railroads what would be the most generally desirable inside dimensions and width of door for a standard 60,000-lb. capacity interchange box car. Replies were received from most of the railroads addressed, and the recommendations represented over 760,000 cars. No private car lines were asked for their opinions in this matter, so that the above figure represents a large majority of the total freight cars in use in the United States that are owned by railroad companies. The committee came to the conclusion that the designs to be presented by them should be governed by the following conditions:

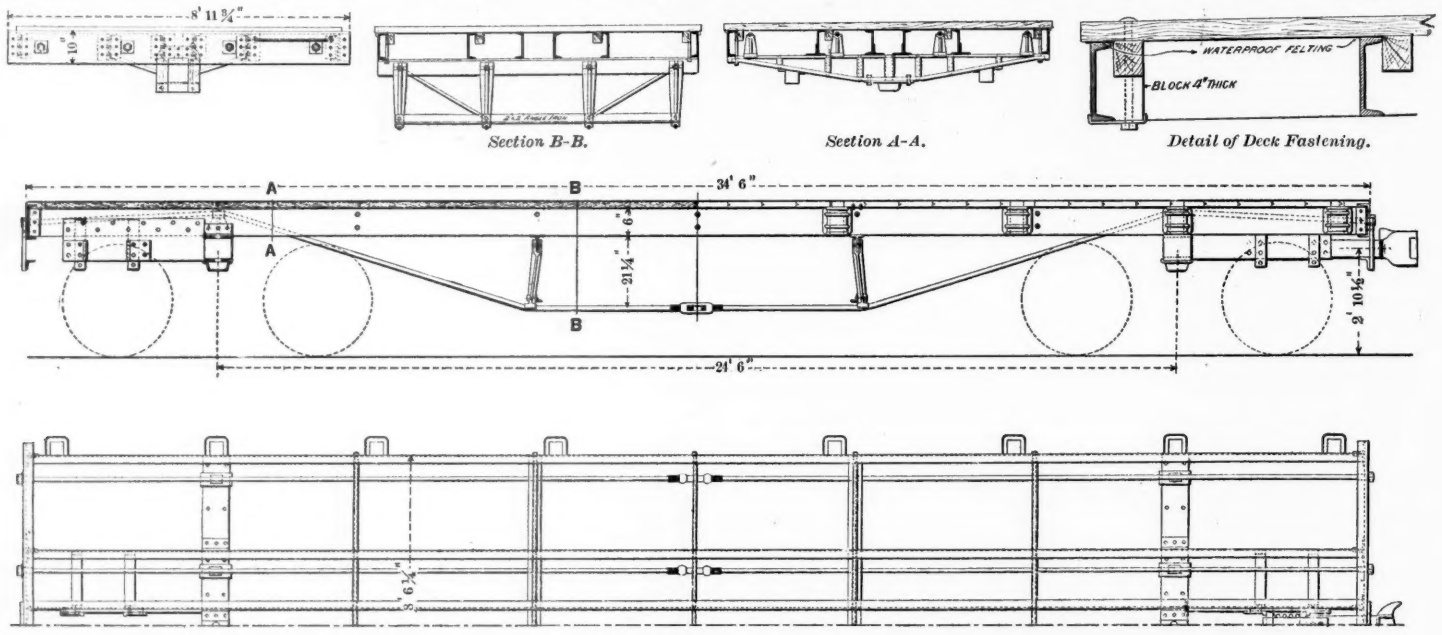
First, the inside length should be 34 ft. for a standard box car of 60,000 lbs. capacity. The vote for this particular length and 34 ft. 4 in. being 509,000 cars, while the only other dimension receiving a vote of any considerable strength was 36 ft., which received 90,000 votes.

Second, the inside width should be 8 ft. 4 in. for a standaad 60,000-lb. capacity box car.

Third, the height from the top of the floor to the top of plate should be 7 ft. 6 in. for a standard 60,000-lb. capacity box car




Steel Underframe—J. N. Barr.




Steel Underframing—G. R. Joughins.

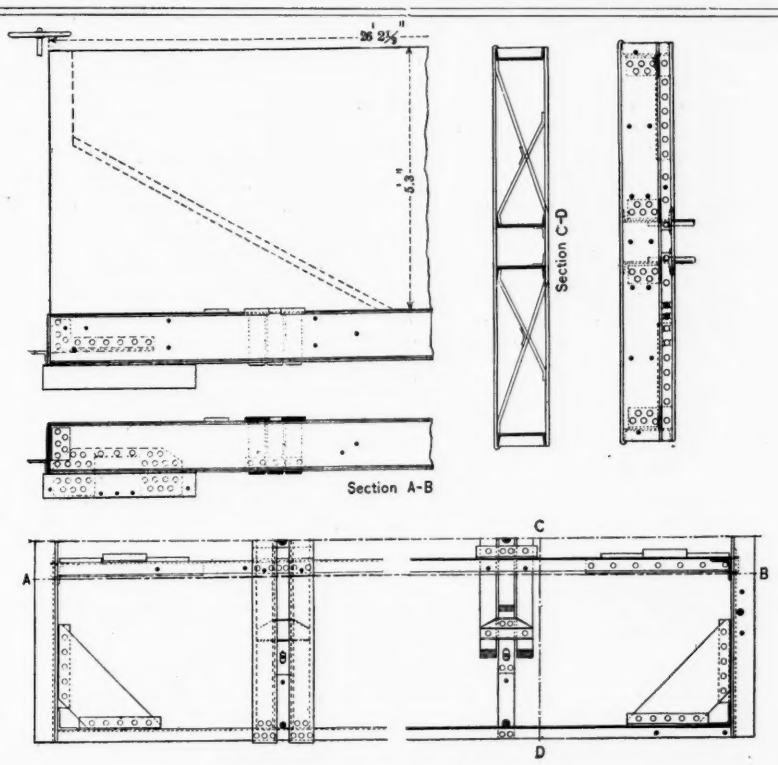
Fourth, the width of the side door should be 5 ft. 4 in. clear for all box cars.

Fifth, the end doors, if any are used, should be 24 in. wide by 36 in. high.

Sixth, the height from the top of the rail to the top of the floor should be 4 ft. 2 in.

Seventh, the design should show the end sill flush and not projecting beyond the siding.

It is particularly desirable, whatever design of steel underframe be adopted as standard or as recommended practice of your association, even if the detail of the fastenings and less important parts be left to the individual choice of the builder, that the length, section and weight of the main sills, end sills, draw gear and bolster be shown on the association's drawings, so that the rolling mills and car builders can take advantage of market




Steel Underframe—Norfolk & Western.

fluctuations to buy stock, and further, that the stock of sills carried by railroads for their own use can also be depended on to suit any steel-framed interchange freight car that may be damaged on their line. Therefore, in presenting these drawings for the criticism, choice, and we hope, approval of your association, we earnestly urge that the dimensions for a standard interchange freight car mentioned above, to which these drawings have been made to conform, should be submitted to the association by letter ballot, for adoption as standard, and that the association will make a choice of one of the designs presented and adopt it or its leading features and dimensions as recommended practice.

Your committee also specially urges that the dimensions recommended for standard interchange box cars, as far as length of sills, width and height from the rail are concerned, should be also adopted for other flat bottom freight cars of 60,000-lbs. capacity, such as stock, gondolas and and flat cars, so that the same standard steel sills, bolsters, end sills and draft gears will suit for all these classes of cars of the same capacity.

With reference to the question of increased capacity of freight cars for general interchange service, your committee requested the railroads to give it their recommendations for the size of a standard box car of greater capacity than 30 tons. The replies received indicate that the great majority of the motive power officers of the railroads were not prepared to consider a car of greater capacity than 30 tons for general interchange service. It is probable that with the general introduction of steel framing for freight cars a greater capacity than 30 tons will be found to be economical, especially where loads can be obtained in both directions, and that the objection to, or unwillingness to consider, cars of greater dimensions than those now used for 30 tons capacity has been brought about by the unceasing trouble caused to the operating departments by the presence of a small number of especially large cars, which are too often used by traffic officers as bids for freight and cause trouble in other ways which have been well ventilated in the recent discussions on the large car problem.

These difficulties, however, can be entirely overcome, it is believed, by the adoption of a standard cubic capacity per ton of 2,000 lbs. for interchange box cars, assisted by the revision of the minimum freight rates by the traffic officers, which can be based on this standard unit of capacity per ton. It is, therefore, further recommended that the figure of 70 cu. ft. per ton of 2,000 lbs. for the capacity of freight box cars should also be submitted to the asssociation by letter ballot for standard, this figure conforming with the dimensions for the box car mentioned in the early part of this report and to conform to which these drawings have been prepared.

The members of this committee are Messrs. J. N. Barr, C. M. Mendenhall, R. P. C. Sanderson, S. A. Charpiot, G. R. Joughins.

The essential features of the designs submitted are reproduced:

*Box Car Frame Submitted by J. N. Barr.*

It has been the intention of the designer to meet certain requirements which do not come into consideration at all in the design of stationary metallic structures, but which appear to be of extreme importance in car construction. In the usual conditions of service, cars are constantly subjected to severe and often destructive shocks longitudinally at the middle point of the end, or at the location of the draft arrangements. In addition to the local damage resulting from these shocks, a tendency to distortion of the framing is caused, whereby the middle longitudinal sills, or center sills, move in one direction, and the intermediate and outside sills move in the opposite direction. This differential motion must be resisted, and if resisted by a very rigid and inflexible construction will result in injury and gradual destruction to the framing.

Cars are also subjected to frequent damage at the ends, and it is important to provide for ready and cheap repairs at this location, so that removal of parts may not involve the general framing of the car.

In the construction presentcd it is sought to provide for these requirements:

*First.* The general frame is flexible longitudinally.

*Second.* The end of the framing is so constructed that in ordinary cases of damage repairs can be made without affecting the general framing.

*Third.* The means of attachment of draft rigging to car is readily removed without disturbing the general framing.

Longitudinal flexibility is obtained by avoiding all diagonal bracing and gussets by making the fastenings between sills, as shown at *A*, so that a distortion will beat the fastening *A* and not shear the rivets, and, by providing four longitudinal binding rods *B*, running full length of the car.

The general framing is protected from damage by being discontinued 9 in. from inside of end sill. The end sill is carried by short wooden sills fastened to the through iron sills.

The draft timbers are fastened to iron plates which extend from the end sill to the transom. This plate can be removed without disturbing the general framing.

Vertical strength at center of the car is secured by truss rods.

*Design Submitted by R. P. C. Sanderson.*

The following bill of material is for the steel underframing of box or stock cars of 30-tons capacity. For float-bottomed gondolas and flat cars use the same framing in all details, except that side sils should be 10-in. channels instead of 9-in., the cross girders being deepened at the outsidez to suit, and the wooden side sills should be omitted.

The design is calculated for a maximum fibre stress of 15,000 lbs. per sq. in. for a uniformly distributed load of 66,000 lbs. All rivet and bolt holes to be punched for ¾-in. The holes for drawbar stop rivets and rivets in angles F to be reamed. The weight of the steel frame complete is 6,959 lbs. To this add for the wooden sills, joints, pockets and bolts 963, which gives a total of 7,922 lbs. Actual weight of the corresponding posts of a 30-ton, 8-sill wooden framed car of 30,500 lbs., total light weight, is 9,626 lbs. Differences in favor of steel, the frame being 1,704 lbs.

*Design Submitted by G. R. Joughins.*

The ideas governing the designs submitted by me are:

*First.* Ample vertical strength.

*Second.* Simplicity, avoiding blacksmithing and boiler-making as much as possible.

*Third.* No holes in flanges of longitudinal sills.

*Fourth.* Accessibility for painting, repairs, etc.

Several years' experience with flat cars built according to these designs, or more exactly according to the designs of the Norfolk & Southern car, illustrated in last year's proceedings, shows only one weakness: that is the tendency of the stakes when cars are heavily loaded with logs, to twist and distort the side sills.

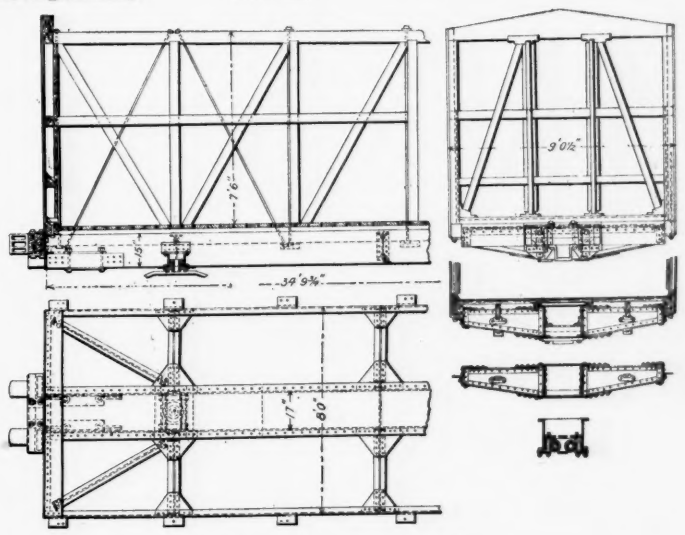
This tendency can be overcome in many ways, but it is found that the web of the side sills ought to be ⅝ of an inch thick to prevent them buckling, and that they must be braced to prevent them twisting. On gondola cars this weakners would not exist. The platform, made up in four lengths, easily detachable from the frame, is found to be a great convenience when painting, etc.

Because the sills are protected from the weather there is not the same necessity for steel sills on box cars as there is on open cars; moreover, the tops of the sills cannot be so readily exposed for painting. On the other hand, the steel sills would also enjoy protection from the weather and therefore would not rust so quickly; it is furthermore expected that the great value of steel frames in strength, durability and economy will be so demonstrated by experience with open cars that their use will be universal.

The underframe should be sufficiently strong to support the whole weight without assistance from the superstructure; indeed, it is hoped that the design of frame which would be used for flat and box cars will be identical, the only exception being the method of attaching the necessary timber work.

The proposed method of attaching the superstructure to the sills is merely a suggestion, pointing out a possible means of connection; the ends particularly require close study.

The designs are intended to convey the general principles advocated, combined with the results of actual experience with steel cars.




Steel Underframing—R. P. C. Sanderson.

Longitudinal sills should all be the same depth to provide uniform support. The weights per foot of sills under cars in use as follows: Center sills, 15 lbs. per foot; side and intermediate sills, 11 lbs. per foot; these side sills, although strong enough for vertical load, are too weak to properly hold the stake pockets under severe strains, and therefore the web should be $\frac{5}{16}$ in. thick. To conform to the new schedule of sections adopted by the rolling mills these weights should be somewhat increased.

To protect against rust, experience shows that, with un-

*Bill of Material for Design Submitted by R. P. C. Sanderson.*

| No. | Name of part. | Length. | Specification. | Weight. |
|---|---|---|---|---|
| 2 | Cent. sills | 34 ft. 9¾ in. | 15-in. channel C. 1 | 2,296.5 |
| 2 | Side sills | 34 ft. 9¾ in. | 9-in. channel C. 4 | 922.4 |
| 4 | Cent. plate bracket channel | 17 in. | 6-in. channel C. 7 | 73 6 |
| 4 | Diagonal braces | 5 ft. 2 in. | 4-in. × 2½-in. tee T. 63 | 150.6 |
| 4 | Cent. plate bracket angles | 14 in. | 5-in. × 3-in. angle A. 203 | 46.4 |
| 16 | Side bracket angles | 9 in. | 5-in. × 3-in. angle A. 203 | 120.0 |
| 20 | Center sill corner angles | 12½ in. | 2½ in. × 2½ in. A. 48 | 124 8 |
| 20 | Side sill corner angles | 7 in. | 2½ in. × 2½ in. A. 48 | 70 0 |
| 4 | End sill angles | 2 ft. 9¾ in. | 2½ in. × 2½ in. A. 48 | 67.4 |
| 4 | End sill angles | 17 in. | 2½ in. × 2½ in. A. 48 | 33.8 |
| 4 | Dead block angles | 10 in. | 2½ in. × 2½ in. A. 48 | 19 9 |
| 16 | Cross girder top angles | 2 ft. 9¾ in. | 2½ in. × 2½ in. A. 48 | 269.7 |
| 16 | Cross girder bottom angles | 3 ft. 1 in. | 2½ in. × 2½ in. A. 48 | 295.7 |
| 2 | Bottom cover plate stiffening angles | 17 in. | 2½ in. × 2½ in. A. 48 | 16.9 |
| 1 | Top cover plate, 33 ft. 5¼ in. × 24 in. × ¼ in | | | 675.3 |
| 1 | Bottom cover plate, 17 ft. 6 in. × 24 in. × ¼ in | | | 353.5 |
| 2 | End cap plates, 8 ft. × 8 in. × ¼ in | | | 107.7 |
| 2 | End plates, 8 ft. × 10½ in. × ⅜ in | | | 211.4 |
| 2 | End sill reinforcing plate, 3 ft. 1 in. long, ⅜ in. thick | | | 105.7 |
| 4 | End plate packing strips, 6½ × 3 in. × ⅜ in | | | 8.2 |
| 2 | Cent. plate brack. plates, 2 ft. × 18 in. × ¼ in | | | 60.6 |
| 16 | Cent. sill gusset plates, ¼ in. thick | | | 202 0 |
| 8 | Side sill gusset plates, ¼ in. thick | | | 67.0 |
| 8 | Cross girder web plates, ¼ in. thick | | | 203 6 |
| 4 | Draft chafing plates, 3.1 in. × 6½ in. ⅜ in | | | 100.3 |
| | | | | 6,601 0 |
| | Add for rivet heads | | | 358 0 |
| | Weight of steel frame | | | 6,959 0 |

Note.—Letters under the column for specification refer to the Carnegie standard sections.

treated iron, periodical painting is absolutely necessary, but that very little rust develops anywhere except upon the tops of the sills on which the timber platform rests. A strip of waterproof felt laid on top of the sills would assist greatly in avoiding rust, and if the felt was cemented down with some compound (possibly P. & B. compound), it would probably avoid all rust and the necessity for frequent painting. It might be practicable to have the sills galvanized or lacquered to prevent rusting.

Draft gear between the sills, as shown in the Norfolk & Southern car, is considered to be the best practice, if a satisfactory yoke coupler can be attached. The bolsters shown are not quite perfect—they bend upward immediately above the center plate. The bracing of bolsters to center sills seems to be useful. Poling pockets might be attached on the sides at the bolsters instead of at the ends.

PASSENGER CAR PEDESTAL AND JOURNAL BOX FOR JOURNAL 4¼ IN. × 8 IN.

After careful consideration of the subject, and being governed in a great measure by the replies received, the Committee has no hesitation in recommending the adoption of figure No. 2, as shown in circular, for standard passenger car pedestal for journal 4¼ × 8, and for passenger car journal box the present inside dimensions of the standard M. C. B. 4¼ × 8 freight journal box.

The members of this Committee are Messrs. Geo. W. West, T. B. Purves, Jr., E. A. Beuson, F. W. Chaffee, J. W. Marden.

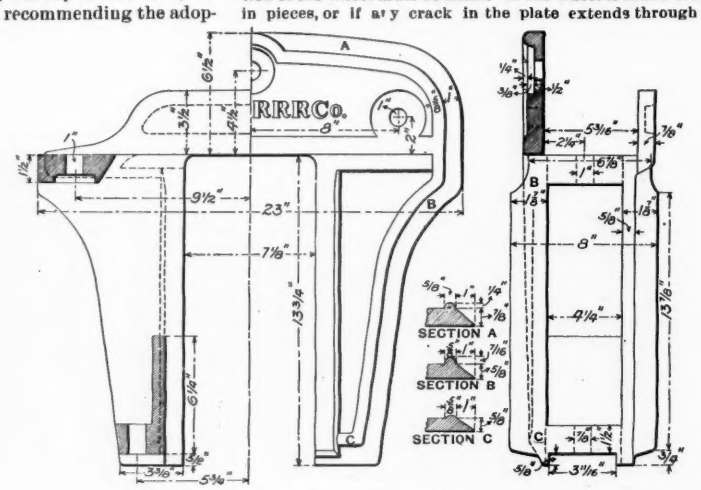



Fig. 2.—Design for Passenger Car Pedestal.

BOX CAR SIDE AND END DOORS.

Replies were received from 28 roads, representing 202,000 box cars. Roads representing 180,000 box cars were in favor of the common batten door, while the balance of the roads were divided between the frame and flush doors.

Roads representing 90,000 box cars were in favor of an overhung door with roller hangers, not patented. The balance of the roads, representing 112,000 box cars, were divided between the different patented hangers and the common slide hangers.

Your committee attempted to design an ideal box car door, but the Western Railway decided that the design was infringing on some patent rights. Your committee, therefore, submits the following designs for box car side and end doors:

The side and end doors to be hung by two cast or malleable iron hangers to each door, each hanger secured to the door by three ⅝-in. carriage bolts and two ⅝-in. dowels, tapering to ½ in. Each hanger to be supplied with a chilled cast-iron roller fitted into the hanger, as shown in the accompanying cut. The top rail to be ⅞ × 2½ in. wide, backed by a piece of oak running full length, being about 1⅛ in. horizontally and 1⅝ in. vertically, the rail to be fastened to this oak strip and through side or end plate by ½ in. countersunk bolts, about 20 in. apart.

The lower edge of door to have an iron rail ⅝ × 2½ in., rabbetted flush into the lower cleat and projecting 1 in. below bottom edge of door, and fastened with button-head countersunk rivets ⅝ in. in diameter, passing through the ⅜-in. iron rail, bottom cleat and sheathing of door. These rivets to be about 18 in. apart; also two button-head rivets ½ in. in diameter, passing through the ⅜-in. iron rail, ⅝ in. from bottom of rail, and so located that the button-heads will come in contact with the door brackets when door closes, thereby holding door tight against car body when door is closed. The cuts accompanying this report fully illustrate the style of brackets to be used and location of same. [Cuts not reproduced. Editor.]

It would be useless to recommend a standard size of door, as the door will have to correspond with the door openings of the various sizes of box cars. The recommended door, however, is the common batten door, with three pine cleats 10 in. wide, and located at top and bottom edges and center of door on the inside, and filled in on the two side edges by filling strips 5½ in. wide, the door to lap 2 in. on closing side against an oak stop strip, running full length of door and fastened to the door post by ½-in. lag screws; the door to lap on door post on opposite side of door at least 4 in. The door fastenings for seal to be the common hasp and eye bolt, in connection with the seal pin and tin seal, and located a suitable distance from bottom edge of door.

The most practical end door fastening is that which fastens on the inside, requiring no seal.

In conclusion, your committee recommends that the standard side and end doors for box cars, including fixtures, top and bottom rails, seal pins, brackets etc., be in accordance with that illustrated in the cuts presented herewith.

The members of this committee are Messrs. J. J. Hennessey, C. A. Schroyer, Geo. F. Wilson, G. N. Dow, Robt. Gunn.

SPECIFICATIONS AND GUARANTEE FOR CAST-IRON WHEELS.

The committee submits a revised specification and also submits a form of special contract which are recommended for adoption. The specifications differ from those now standard in a few particulars. In Sec. 1 the variation in diameter of chill is reduced from $\frac{1}{16}$ of an inch to $\frac{1}{32}$. In Sec. 2 to the sentence "the tread must be free from deep and irregular wrinkles, etc.," are added the words "and swollen rims." Sec. 3 is modified by increasing the maximum allowable depth of white iron on the tread from ⅞ of an inch to 1 in., and increasing the minimum in the throat from $\frac{3}{16}$ in. to ¼ in. Sec. 4 is changed by adding a heat test as follows:

Or, the wheel must be laid flange down in the sand, and a channel way 1½ in. wide and 4 in. deep, must be molded with green sand around the wheel. The clean tread of the wheel must form one side of this channel way, and the clean flange must form as much of the bottom as its width will cover. The channel way must then be filled to the top with molten cast iron, which must be hot enough when poured, so that the ring which is formed, when the metal is cold, shall be solid or free from wrinkles or layers. The time when the pouring ceases must be noted, and two minutes later an examination of the wheel must be made. If the wheel is found broken in pieces, or if any crack in the plate extends through the tread in either of the wheels tested, the one hundred wheels represented by the tests will be rejected.

Sec. 7 has been altered to call for the use of the M. C. B. limit gage for flanges. Sec. 9 is new and is as follows:

9. Individual wheels will not be accepted which
1. Do not conform to standard design and measurements;
2. Are under or over weight;
3. Have physical defects described in Sec. 2.

Any lot of one hundred wheels submitted to test will not be accepted:

1. If wheels broken do not meet the prescribed strength test;

2. If the conditions prescribed in Sec. 3 are not complied with.

Some extracts from the report of the committee follow:

Your committee is of the opinion that the guarantee adopted in 1893 has never been put in practical operation, and is inclined to think that in some of its requirements it is impractical. After securing proper strength, which is effected by the general specifications, the most important consideration to a railroad company is that of mileage. Our specifications are quite full on the matter of strength, but strength to a great extent varies inversely as durability.

It can be stated as a fact that the mileage of the best average wheels is nearly twice as great as the average of the poorer wheels. This is most important for railroad officials to consider. They are not in position to watch the details of manufacture or the materials used, or to determine by an inspection of a few wheels how much wheel service they lose by wheels falling short of the best that can be done in material, strength, chill, etc. If now railroad officials should purchase mileage instead of wheels they would get just what they pay for, and if one wheel-maker should furnish 100,000 miles of wheel mileage for less money than another, there would be no uncertainty in the contract, as there is when wheels are bought for, say, $5, when $6 wheels may furnish $10 worth of mileage as compared with the $5 wheels. This problem might be practically solved by a contract of somewhat the following form:

1. The foundry company agrees with the railroad company to furnish a sufficient number of 33-inch chilled cast-iron wheels to give 100,000,000 miles of service if used and worn out under passenger cars with six-wheel trucks, 80,000,000 miles of service if used and worn out under under passenger cars with four-wheel trucks, 60,000,000 miles of service if used and worn out under locomotive tenders and a proportionate mileage if used under freight cars.

2. For this purpose 1,000 wheels will be furnished for the sum of $8,000.

3. At least 20 per cent. of the wheels furnished under this agreement, selected so as to represent the entire lot, shall be used under passenger cars and tenders, and the record of the mileage and cause of removal of the same shall be kept.

4. When 90 per cent. of the wheels used under passenger cars and tenders are removed, the average mileage of the worn-out wheels shall be determined.

5. If the average mileage of the worn-out wheels thus determined equals or exceeds 100,000 miles for the wheels used under passenger cars with six-wheel trucks; 80,000 miles for the wheels used under passenger cars with four-wheel trucks, and 60,000 for the wheels used under tenders, it shall be held that the wheels used for freight cars will give a proportionate mileage, and it shall be considered that the foundry company has fulfilled this agreement.

6. If, however, the average mileage as determined above shall fall short of the figures specified, then the foundry company agrees to pay to the railroad company, either in cash or in wheels as may be agreed, the value of such average shortage for each and every wheel furnished under this agreement, whether used in passenger car, tender or freight car service.

7. Wheels shall be considered worn out, etc., etc.

The figures mentioned above are simply typical and can be modified, but with an agreement as above the purchaser knows he is buying a definite quantity, the the wheel-maker knows he is furnishing a definite quantity, and has every reason to do the best possible.

The transaction in the case of a given lot of wheels will be completed in about two years. With the present freight wheel guarantee the transaction covers such a length of time, and that time is so inadequate for proper protection, that it is a little better than a farce.

All the evidence which has been presented to your committee goes to show that wheels which show certain service under passenger cars and tenders, show corresponding service under freight cars.

With reference to the present guarantee on freight car wheels, of four or five years' minimum service, it is generally recognized by close observers that this is a guarantee which does not guarantee. The average service of a fair ordinary chilled wheel is between seven and eight years, and in many cases this average is increased to 12 or 14 years. The futility of a four or five year guarantee can be readily seen from the above.

It is the opinion of your committee that with fair material a 580-lb. wheel is perfectly safe for 60,000-lb. cars, and in view of the fact that the lighter cars are rapidly disappearing, it is recommended that wheels less than 550 lbs. should not be cast.

The tables attached show the number of blows required to break a piece out of the wheel, the drop weighing 100 lbs. and falling 7 ft., the test having been made on one lot of wheels denominated "light pattern," which weighed 554 lbs., the other test being made on a lot of wheels denominated "heavy pattern," which weighed 580 lbs It will be seen that the average number of blows necessary to break a piece out of the light or 550-lb. pattern, was 58; with the 580-lb. pattern the number of blows required to break a piece out was 91. This shows a very great increase in strength produced by the addition of an average of 26 lbs. to the weight of the wheel, as revealed by the drop test, and it would seem to indicate that if the 550-lb. wheels give satisfactory service under 40,000-lb. cars and lighter, that the increase in strength in 580-lb. wheels more than meets the increased requirements of service under 60,000-lb. cars.

In conclusion your committee recommends that the Master Car Builders' Association adopt the specifications presented above as recommended practice; they also recommend that the wheel agreement as presented above be indorsed by the association as recommended practice; that the minimum weight of wheels cast be not less that 550 lbs. and that the maximum weight averaging 580 lbs. is sufficient to meet all practical requirements.

The members of this committee are Messrs. J. N. Barr, S. P. Bush, John Hodge, J. H. McConnell, William McWood.

REVISION OF AIR BRAKE AND SIGNAL INSTRUCTIONS.

The Joint Committee of the two associations consists of nine members, Mr. Grieves being Chairman for the M. C. B. Committee and Mr. Rhodes for the M. M. Committee. These committees have agreed to recommend certain changes in the instructions and submit in detail a complete set of instructions for enginemen, trainmen, engine-house foremen and inspectors. Appended is a catechism of general questions regarding the use of air-brakes and train signals. The whole document is 24 pages, and of course its value consists largely in thoroughness and minuteness of detail. Therefore we shall not make any abstract of it.

LOADING LOGS, LONG STRUCTURAL MATERIAL, ETC.

The general report of this committee is in substance as follows:

A request for sketches showing racking at the end brought replies to the effect that there was such a variety of construction that it would be impracticable to show it by sketch, but that where there were end stakes they should be utilized, and where there were no end stakes there should be cross pieces from outside stakes nearest the end of car. This brings up the recommendation of the committee last year, that there should be uniformity in the staking of cars, and those stakes should be spaced so as to allow of the recommeded practice being complied with. This would in our opinion be best accomplished by placing one poeket in the center on the side of the car and spacing so as not to exceed three and one-half feet from center to center of pockets, bringing the center of bolster approximately central between two stakes and placing the end pocket on the side as near the end sill as possible, so that one side of the stake would come in line with the inside of stake through the floor of car at the end, the pockets for which should be bolted to the inside of the end sill. This staking would allow of sufficient stakes being used when lading was carried on two cars without spreading them to the extent of excessive binding when on a curve, or at least to a greater extent than the construction now prevalent.

Where it was recommended that ties, cordwood, etc., be loaded lengthwise of the cars, it was very generally stated that the ends nearest the ends of the car should be raised and placed upon crossbearings securely fastened to the floor of the car. In view of the fact that most of this loading is local, and not to any extent subject to interchange, the only recommendation the committee feels called upon to make is that all stone shall be cleated with strips not less than 1½ in. thick nor less than 4 in. wide, securely fastened to the floor of the car with not less than one tenpenny fence nail to every

9 in., such nails to be staggered so as to be within 1 in of the edge of the strip alternately. That lumber dressed on one or both sides when loaded on gondola or platform cars must be racked at each end of the car in such a manner as to prevent the load from shifting. That all flat cars should have pockets applied in such a manner that the two end stakes and two side stakes at each end of the car can be utilized for this purpose.

To this report are appended rules governing the loading of lumber and timber on open cars, general instructions, regulations in regard to loading and carrying long structural material, with general and detailed instructions and numerous diagrams. The document would be of little value unless presented at considerable length with the drawings. Therefore we make no attempt to abstract it.

dimensions of arch bars and column bolts as shown in the following table:

| Wheel base. | Distance between top and bottom arch bars at column bolts in inches. | Cross bars section of in inches. Top arch bar. | Bottom arch bar. | Tie bar. | Diam. of column bolt in inches. |
|---|---|---|---|---|---|
| Greater than 5 ft. and not more than 5 ft. 6 in... | 14½ to 16½ | 1⅜×4 | 1¼×4 | ½×4 | 1⅜ |
| | 16½ and greater | 1¼×4 | 1⅛×4 | ½×4 | 1⅛ |
| 5 ft..... | 14½ to 16½ | 1¼×4 | 1⅛×4 | ½×4 | 1⅜ |
| | 16½ and greater | 1¼×4 | 1 ×4 | ½×4 | 1⅛ |
| Less than 5 ft..... | 14½ to 16½ | 1⅛ 4 | 1 ×4 | ½×4 | 1⅛ |
| | 16½ and greater | 1 ×4 | ⅞×4 | ½×4 | 1⅛ |

| | | |
|---|---|---|
| Gage | 4 ft. 8½ in. | 4 ft. 8½ in. |
| Fuel | Bituminous coal | Bituminous coal |
| Weight on drivers | 99,000 lbs. | 99,800 lbs. |
| " " truck wheels... | 33,000 lbs. | 24,400 lbs. |
| " total | 132,000 lbs. | 124,200 lbs. |
| Wheel base, total, of engine | 24 ft. 2 in. | 22 ft. 6 in. |
| Wheel base, driving | 14 ft. | 12 ft. 2 in. |
| Wheel base, total (engine and tender) | 50 ft. 1 in. | 47 ft. 11½ in. |
| Length over all, engine | 36 ft. 0½ in. | |
| Length over all, total, engine and tender | 58 ft. 6 in. | 56 ft. 11 in. |
| Height, center of boiler above rails | 8 ft. 2 in. | 8 ft. 2 in. |
| Height of stack above rails | 14 ft. 9⅛ in. | 14 ft. 9⅛ in. |
| Heating surface, firebox | 139.4 sq. ft. | 129.3 sq. ft. |
| " " tubes | 1910.7 sq. ft. | 1576.5 sq. ft. |
| " " total | 2050.1 sq. ft. | 1705.8 sq. ft. |
| Grate area | 27.3 sq. ft. | 28.5 sq. ft. |
| *Wheels and Journals.* | | |
| Drivers, diameter | 68 in. | 68 in. |

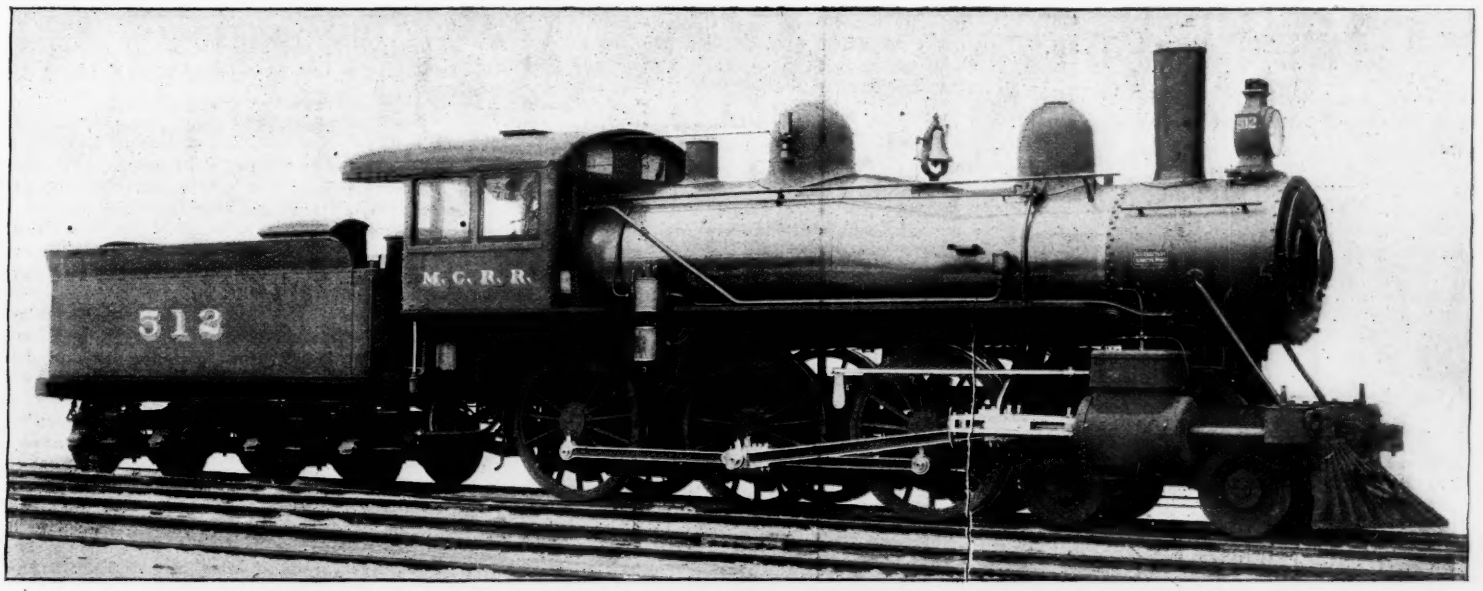



Fig. 1.—Ten-Wheel Passenger Locomotive—Michigan Central Railroad.

*Mr.* ROBERT MILLER, *Superintendent of Motive Power.* *Built by the* SCHENECTADY LOCOMOTIVE WORKS, *Schenectady, N. Y.*

This committee numbers nine members, with Mr. P. Leeds as chairman.

ARCH BARS AND COLUMN BOLTS FOR DIAMOND TRUCKS.

Your committee understands its instructions to be the recommendation of forms and cross-sections of arch bars and column bolts for trucks under cars of 60,000 lbs. capacity, and designs with cross sections for arch bars and column bolts for cars of 80,000 lbs. capacity.

The principal variables which affect the cross-section of the arch bars are:

(1.) The wheel base of the truck. (2.) The vertical distance between arch bars in the center portion of the side frame of the truck. (3.) The location of the point of junction of the top and bottom arch bars vertically; that is making the set equal, or making the bottom arch bar with more set, and the top arch bar with less set, or the

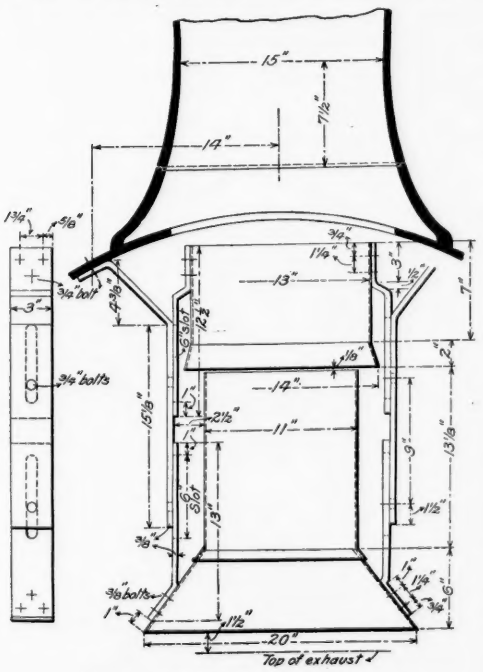



Fig. 3.—Petticoat Pipe—M. C. R. R.

reverse. (4.) The distance between centers of the column bolts.

These variables make it desirable to group the trucks within certain limits, because it is necessary to have different sections of arch bars in different designs of trucks, depending on the variables mentioned.

Taking the results obtained by analysis, your committee would recommend for cars of 60,000 lbs. capacity the

The diameter of the column bolt shown is that when four are used per truck, two through each arch bar. The diameter of 1⅜ in. may seem somewhat large, but it was thought better than using a smaller diameter in order to provide for wear in certain classes of trucks.

In recommending these sizes, it is assumed that material of good quality is used. Wrought iron or steel having a tensile strength of 50,000 to 55,000 lbs. per square inch and an elongation of 20 per cent. on a section originally 2 inches long, would satisfactorily fill the requirements. Material having a tensile strength of less than 48,000 or more than 60,000 lbs. per square inch, or showing less than 15 per cent. elongation on a section originally 2 in. long, or if the test piece shows a granular fracture covering more than 50 per cent. of the fractured surface, should not be used. The material should also be free from cracks or fractures when bent to the required forms.

Your committee does not find it possible, as it hoped might be done, to recommend any standard design, showing amount of set, etc., for arch bars in trucks of 60,000 lbs. cars. . . .

For a truck to carry cars of 80,000 lbs. capacity, your committee would recommend for the top arch bars a section 1⅛ × 4½ in., and for bottom arch bars 1⅜ × 4½ in.; tie bars ⅝ × 4½ in.

The box for which the arch bars are designed is the same as that adopted for recommended practice by the Association, on recommendation of a committee reporting to the convention of 1896.

The members of this committee were Messrs. E. D. Nelson, George Gibbs, J. E. Simons, T. Lyon, J. H. Rankin.

## Some Michigan Central Locomotives.

The Michigan Central engines here described were designed by Mr. Robert Miller, Superintendent of Motive Power and Equipment, one being built by the Schenectady Locomotive Works and three under the direction of Mr. T. J. Hennesy, Master Mechanic, at the Jackson shops of the Michigan Central road.

The engraving Fig. 1 shows engine No. 512, the Schenectady locomotive, which in appearance is quite like those built by the railroad company, the chief difference being that the Schenectady engine has an extended wagon-top, radial stayed boiler, while those built by the company have short wagon-top boilers with crownsheets supported by crownbars and sling stays; engine No. 512 has also a larger heating surface but smaller grate area. All the engines have boiler fronts and doors, dome rings, cylinder head covers, steamchest casing tops and dome caps made of hydraulic flanged steel: the firebox rings are double riveted and the driving boxes and driving wheel centers are of cast steel.

The following table shows clearly the variation in the dimensions of the principal parts:

MICHIGAN CENTRAL TEN-WHEEL PASSENGER LOCOMOTIVES.

| Name or number | 512 | 60, 311 and 5'1 |
|---|---|---|
| Name of builder | Schenectady Locomotive Works | Michigan Central Railroad |
| Drivers, material of centers | Cast steel | Cast steel |
| Truck wheels, diameter | 33 in. | 33 in. |
| Journals, driving axle, size | 8 × 10 in. | 7¼ × 8½ in. |
| Journals, truck axle, size | 5½ × 9 in. | 5⅛ × 8⅝ in. |
| Main crank pin, size | Main rod, 5½ × 6 in.; side rod, 6¼ × 5¼ in. | 5½ × 5½ in. |
| Parallel rod pin, size | 4⅛ × 4 in. | 4¼ × 3⅞ in. |
| Crosshead pin, size | 3½ × 4 in. | 3¼ in. |
| *Cylinders.* | | |
| Cylinders, diameter | 19 in. | 19 in. |
| Piston, stroke | 24 in. | 24 in. |
| " rod, diameter | 3¼-in. body, enlarged ends extended through front cylinder heads | 3½ in. |
| Main rod, length center to center | 9 ft. 10⅛ in. | 9 ft. 4 in. |
| Steam ports, length | 18 in. | 18 in. |
| " " width | 1⅝ in. | 1⅝ in. |
| Exhaust ports, length | 18 in. | 18 in. |
| " " width | 2 in. | 3 in. |
| Bridge, width | 1⅝ in. | 1¾ in. |

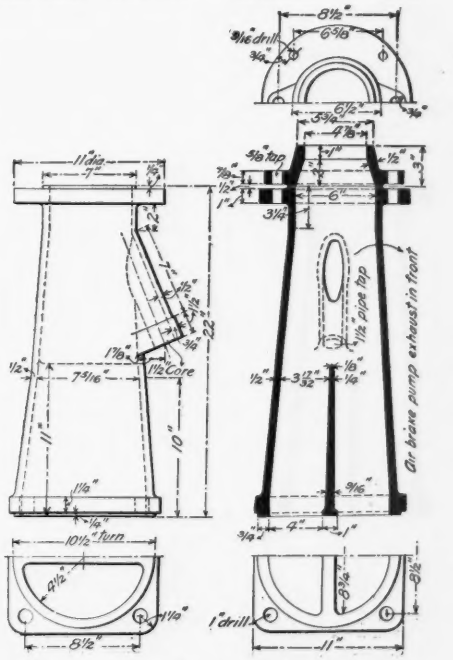



Fig. 4.—Exhaust Nozzle—Michigan Central.

| | | |
|---|---|---|
| Valves, kind of | Allen-Richardson balanced | Allen-Richardson balanced |
| " greatest travel | 5½ in. | 5½ in. |
| " outside lap | ⅞ in. | ⅞ in. |
| " inside lap or clearance | 1/32 in. | 1/32 in. |
| " lead in full gear | None | None |
| *Boiler.* | | |
| Boiler, type of | Extended wagon top | Wagon top |
| " working steam pressure | 180 lbs. | 180 lbs. |

| | | |
|---|---|---|
| Boiler, material in barrel | Carbon steel | Carbon steel |
| " thickness of material in barrel | $\frac{9}{16} \times \frac{5}{8}$ in. | $\frac{5}{16}$ in. |
| Boiler, diameter of barrel at front sheet—outside | 58 in. | 58 in. |
| Seams, kind of, horizontal | Butt joint, quadruple riveted, inside and ouside welt strips | Butt joint, welt strips inside and outside, quadruple riveted |
| Seams, circumferential | Double riveted | Double riveted |
| Thickness of tube sheets | $\frac{1}{2}$ in. | $\frac{1}{2}$ in. |
| " crownsheet | $\frac{5}{8}$ in. | $\frac{5}{8}$ in. |
| Crownsheet stayed with | 1 in. radial stays | Crownbars and sling stays |
| Dome, diameter—outside | 30 in. | 30 in. |
| Tubes, number | 272 | 241 |
| " material | Charcoal iron | Syracuse iron |
| " outside diameter | 2 in. | 2 in. |
| " length over sheets | 13 ft. 6 in. | 12 ft. 6 in. |
| Firebox, length | 8 ft. | 8 ft. $0\frac{3}{16}$ in. |
| " width | 3 ft. 5 in. | 3 ft. $6\frac{7}{8}$ in. |
| " depth front | 70 in. | $59\frac{1}{4}$ in. |
| " depth back | 50 in. | $56\frac{1}{4}$ in. |
| " material | Shoenberger steel | Shoenberger steel |
| " thickness of sheets | $\frac{3}{8}$, $\frac{1}{2}$ and $\frac{5}{16}$ in. | $\frac{5}{16}$ in. |
| Firebox, brick arch | Yes, on studs. | Yes. |
| " water space, width: Front | 4 in. | 4 in. |
| Firebox, water space, width: Sides | $3\frac{1}{2}$ in. | 3 in. |
| Firebox, water space, width: Back | 3 in. | 3 in. |
| Grate, kind of | Rocking, finger bars | Rocking, finger bars |
| Smokebox, diameter | 61 in. | 60 in. |
| " length from tube sheet to end | 68 in. | $70\frac{1}{16}$ in. |
| *Other parts.* | | |
| Exhaust nozzle | Single | Single |
| " " | Permanent | Permanent |
| " " diameter | $4\frac{7}{16}$ in. and $5\frac{1}{4}$ in. | 5 in. |
| " " distance of tip below center of boiler | $5\frac{1}{4}$ in. | 3 in. |
| Netting, wire or plate | Wire | Wire |
| " size of mesh or perforation | $2\frac{1}{2} \times 2\frac{1}{4}$ in. | $2\frac{1}{2} \times 2\frac{1}{4}$ in. |
| Steam gages | Ashcroft Mfg. Co. | ..... |
| Engine truck springs | Schenectady | A. French Spring Co. |
| Driving springs | " | " |
| Tender springs | " | " |
| Piston rod packing | U. S. Metallic Packing Co. | U. S. Metallic Packing Co. |
| Valve " | " | " |
| Piston rods | Taylor iron | ..... |
| Crank pins | "Coffin Process," Cambria steel | ..... |
| Truck wheels | Standard Steel Works | ..... |
| Driving boxes | American Steel Casting Co. | ..... |
| Boiler lagging | Magnesia sectional | ..... |

In the matter of performance these engines have given very satisfactory service. Engine No. 512 is used between Jackson and Detroit hauling the through express trains, and on three occasions when late has maintained an average speed of 60 miles an hour for the 71 miles between the yard limits of Detroit and those of Jackson. The weight of the trains hauled varies from 600,000 to 625,000 lbs, made up entirely of heavy vestibuled cars. Engines Nos. 60, 311 and 511 haul the same trains between Jackson and Michigan City, and have made a showing equal to that of engine No. 512.

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An interesting engine on the Michigan Central is No. 20, recently rebuilt at the Jackson shops for hauling a fast local passenger train between Jackson and Detroit. This engine is of the 8-wheel type and originally had cylinders 18 in. × 24 in., a working boiler pressure of 135 lbs. and a 3-in. double exhaust nozzle and diamond stack. In rebuilding the engine, it was equipped with an entire new wagon-top boiler designed for a steam

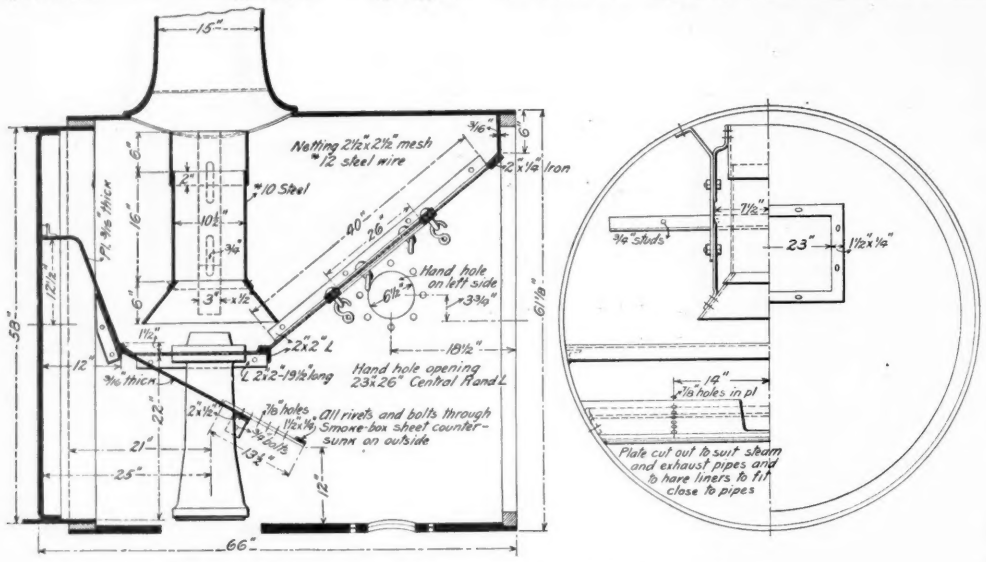


Fig. 2.—Standard Front End Arrangement—Michigan Central Railroad.

| | | |
|---|---|---|
| Stack, straight or taper | Taper | Taper |
| " least diameter | 18 in. | 15 in. |
| " greatest diameter | 19 in. | $18\frac{1}{2}$ in. |
| " height above smokebox | 4 ft. 1 in. | 4 ft. 1 in. |
| *Tender.* | | |
| Type—Six-wheel or with swivel trucks | Swivel | Swivel |
| Tank capacity for water | 3,900 gals. | 3,800 gals. |
| Coal capacity | 8 tons. | 8 tons. |
| Kind of material in tank | Steel. | Steel. |
| Thickness of tank sheets | $\frac{3}{8}$ and $\frac{1}{4}$ in. | $\frac{3}{16}$ and $\frac{1}{4}$ in. |
| Type of under-frame, wood or iron | $6\frac{1}{2} \times 4 \times \frac{3}{4}$ in. angle iron | Iron |
| Type of truck | Arch bar with channel iron bolster and cross beam. | ..... |
| Truck with swinging motion or rigid bolster | Floating | Rigid |
| Type of truck spring | Double elliptic | Elliptic |
| Diameter of truck wheels | 36 in. | 33 in. |
| Diameter and length of axle journals | $4\frac{1}{4} \times 8$ in. | $4\frac{1}{4} \times 7\frac{1}{2}$ in. |
| Distance between centers of journals | 6 ft. 3 in. | ..... |
| Diameter of wheel fit on axle | $5\frac{5}{8}$ in. | $5\frac{1}{4}$ in. |
| Diameter of center of axle | $4\frac{5}{8}$ in. | $4\frac{1}{2}$ in. |
| Type of truck bolster | Channel iron | ..... |
| Type of truck transom | " " | ..... |
| Length of tender frame over bumpers | 20 ft. $3\frac{1}{4}$ in. | 22 ft. $8\frac{5}{8}$ in. |
| Length of tank | 19 ft. | 19 ft. |
| Width of tank | 8 ft. 6 in. | 8 ft. 6 in. |
| Height of tank, not including collar | 4 ft. $2\frac{1}{2}$ in. | 4 ft. 2 in. |
| Height of tank over collar | 5 ft. 6 in. | 5 ft 6 in. |
| Type of back drawhead | Thurmond coupler | Thurmond coupler |
| With or without water scoop | Without | Without |

*Names of Manufacturers of Special Equipment.*

| | | |
|---|---|---|
| Wheel centers | American Steel Casting Co. | American Steel Casting Co. |
| Tires | Krupp & Midvale | Krupp & Midvale |
| Axles driving | Taylor | Cambria Iron Co. |
| Sight-feed lubricators | Detroit Lubricator Co. | Detroit Lubricator Co. |
| Bell-ringer | Hudson | Hudson |
| Front and back couplers | Thurmond | Thurmond |
| Safety valve | Consolidated Safety Valve Co. | Consolidated Safety Valve Co. |
| Muffler | ..... | ..... |
| Steam heat equipment | Consolidated Car Heating Co. | Consolidated Car Heating Co. |
| Reducing valves | Mason Reg. Co. | Mason Reg. Co. |
| Sanding devices | H. L. Leach | H. L. Leach |
| Injector | Nathan Mfg. Co. | Nathan Mfg. Co. |
| Driver brake equipment | American Brake Co. | American Brake Co. |
| Tender brake equipment | Westinghouse | Westinghouse |
| Tender brakebeam | Central steel | ..... |
| Tender brakeshoe | Schenectady | ..... |
| Driver brakeshoe | Rose-Meehan | Sargent Co. |
| Air pump | Westinghouse | Westinghouse |
| Air pump governor | " | " |

pressure of 180 lbs., the cylinders were bushed to give a diameter of $17\frac{1}{2}$ in., and the boiler, steamchest and cylinders were covered with magnesia sectional lagging. The front end was altered by the addition of a moderate extension front; an exhaust pipe 23 in. high over all, having a single nozzle $4\frac{7}{16}$ in. in diameter, is now used with a double-petticoat pipe, while the diaphragm extends 16 in. in front of the exhaust pipe. The new stack is tapered and is 14 in. in diameter at the choke and 50 in. long. The driving wheels of this engine are 69 in. in diameter, and the total weight is approximately 90,000 lbs. with 62,000 lbs. on the drivers. The valves are set line and line in full gear, which gives about $\frac{1}{16}$ in. lead in the running cut-off. The boiler is equipped with a No. 8 Hancock inspirator and a No. 8 Metropolitan injector, and the Leach pneumatic sanding device is used. The steam usually wasted at the safety valves is turned back into the tank and heats the feed water.

This small engine has for several months been doing the work previously done by a 10-wheel locomotive with cylinders 19 in. × 24 in., using a working steam pressure of 160 lbs. The train hauled has usually six cars, consisting of mail, express, baggage and smoking cars, a day coach and a Pullman sleeping car. The smoking car and the day coach used on this train were recently built at the company's car shops at West Detroit and both are heavy, vestibuled cars very handsomely finished. To make the schedule time it is necessary to run at speeds, between stations, approaching 60 miles an hour

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An important change was made about a year ago in the arrangement of the front ends of the standard 10-wheel and mogul engines used on the Michigan Central, which has resulted in a marked saving of fuel. There was formerly used with these engines a single exhaust nozzle $37\frac{1}{2}$ in. long, with a perforated diaphragm back of the nozzle. Much trouble and inconvenience was experienced from cinders accumulating in the smokebox.

Taking as a basis the experiments conducted by the American Railway Master Mechanics' Association, at Purdue University, and at the shops of the Chicago & Northwestern, Mr. Miller designed the arrangement, shown in Figs. 2, 3 and 4, which makes use of a short nozzle and double-petticoat pipe with the diaphragm extended out in front of the nozzle. The arrangement of plates and netting is clearly shown by the engravings.

With the new front end the exhaust nozzle tips were increased from $4\frac{1}{4}$ and $4\frac{3}{8}$ in., as formerly used, to $4\frac{7}{8}$ and 5 in. where the boiler pressure was 160 lbs. and 180 lbs. per square inch, respectively. On a few engines it has been possible to use a tip as large as $5\frac{1}{4}$ in. Another advantage arising from the new smokebox apparatus is that the cinders are all thrown out at the stack after being ground up during their passage through the plates and netting. While there is no accumulation of cinders in the smokebox, yet it is found that these engines throw very little fire from the stack. This is undoubtedly due to the cinders being reduced to very small particles.

Another change which is being made in the standard 10-wheel locomotives is the substitution of swing bolsters for the rigid bolsters of the front trucks and in placing the flanged tires on the front and back driving wheels and the plain tires on the middle pair of drivers. Formerly the blind driving wheels were in front and trouble was experienced by the cutting of the flanges of both driving and truck wheels. Since making the two changes mentioned this difficulty has been overcome.

## Locomotive Firebox Design.

BY R. P. C. SANDERSON.

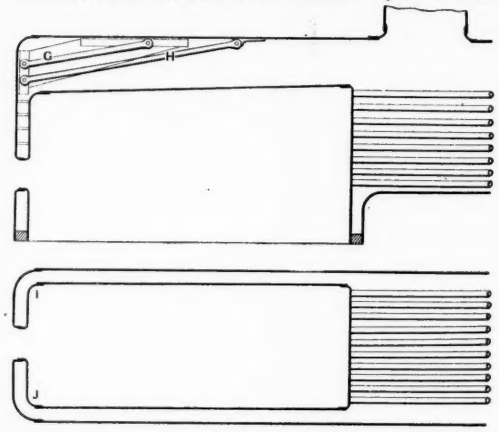
"Much has been said and more may be said as to the respective merits of crownbars and radial stays in such construction. The Board believes that this is a subject which should receive the earnest consideration of all persons engaged in boiler construction, even to a greater extent than now."

These words were read by the late Commissioner Rickard, quoting from the report of the New York State Commissioners on the subject of boiler explosions, at the opening of the noon-hour discussion on this subject on June 23, 1896, at the last Master Mechanics' Convention. The writer has followed the Commissioner's mandate, has given the subject close personal attention since then and particularly so because the matter had forced itself on his attention repeatedly for 10 years previously. The following are some of the personal experience which have brought this matter of locomotive boiler construction prominently under the writer's notice, and the search for causes has led from one thing to another until it is believed that the knowledge gained and points brought out may be of interest to others and profitable to some.

In 1882 a batch of locomotives, 15 in number, was purchased having Belpaire fireboxes made of Otis firebox steel. Now, in 1897, every one of these original fireboxes is in the boilers in serviceable condition, many of them having some years life left yet. They have been, mud-burned, scorched, cracked, plugged and patched but there they all are.

In 1883 a batch of locomotives, 16 in number, was purchased having radial stayed boilers with fireboxes of the same Otis firebox steel, and eight others precisely the same, but with firebox plates of Lowmoor and similar special iron. These 22 engines were placed in the same service, with the same water and coal as the Belpaire boilers, often running on the same divisions at the same time. Every one of these has had new fireboxes and some of them have had two. The same is true of five other locomotives purchased about the same time with Otis steel-radial-stayed fireboxes, but of a different design for different service.

Twenty locomotive boilers of both radial stayed and Belpaire patterns were fitted with circulating plates $\frac{1}{8}$ in. thick in the side water spaces, through which sheets the staybolts were screwed. They gave a great deal of trouble on account of the narrow spaces becoming choked up with mud and scale, requiring much care in washing and occasionally causing a mud burn. But the curious thing about all these boilers fitted with circulating sheets was that we occasionally found staybolts broken in three pieces, one end sticking in the firebox sheet, one end in the outer sheet and a middle portion remaining in the circulating sheets. Certainly the pressure had nothing to do with the second breaking of these staybolts.




*Figs. 5 and 6.*

Sanderson on Fireboxes.

Each style and build of boiler has its own peculiar places where the staybolts are usually found broken. In crownbar and Belpaire fireboxes that are short and deep

the top side rows, and occasionally the top back rows, are these most subject to breakage, and numbers of these stays showed, from the fracture, that they had been broken by vertical bending, the line of last parting being horizontal, or approximately so. In Belpaire fireboxes 10 ft. and thereabouts in length, the top side rows at the ends are those most subject to breakage; but numbers of these examined showed that they were broken by horizontal bending, the line of last parting being approximately vertical. In radial-stayed fireboxes 10 ft. and thereabouts in length, the broken stays are usually found along the side rows down at the reverse bend where the box widens out above the wheels, those near the ends being broken from horizontal bending, while those near the middle of the rows were broken in various directions.

When plotting down the location of the broken stays and cracked firebox sheets for various classes of engines, it was noticeable that in certain classes of boilers, s aybolts seldom or never broke at the places where the cracks in the firebox sheets started and *vice-versa*, unless there was some exceptional cause for it, such as the breakage of staybolts behind small expansion pads not provided with stiffening plates. It was very evident that where the firebox sheets were free to expand and contract they did so, breaking the staybolts at the points of greatest movement. Where not free to expand and contract the sheets crushed, buckled and cracked, but there being no expansion to speak of, the staybolts were not broken.

During boom times when there was an immense increase in traffic and train movement, it was not possible to get enginemen in sufficient numbers of ripe experience, and firemen had to be promoted to the right-hand side rather faster than was good for the service. During this time quite a number of scorched, burned and blown-out crownsheets of the crownbar, radial-stay and Belpaire types were carefully examined and reported on. It was very noticeable that the more instantaneous the giving way of the crownsheet was, the more disastrous were the results, and some cases where the crownsheets were well supported, with large-headed crownbolts, they had held together too well, and finally given way with explosive v olence, blowing the boilers clean off the frames by the recoil. In other cases where the crownsheets were more or less supported by screw-stays riveted over, the crownsheet gave way sooner at some one point, from which point the sheets b igged or tore away, but not with the suddenness which produces explosive results, so that beyond blowing out the ashpans and grates, or in some very bad cases wrapping the crownsheet round the back driving axle, the rest of the boiler and the engine were not materially injured, and the engines seldom left the rails. There is not much danger in a gradual blow-down unless the fire door be open or not firmly latched, in which case the blast of steam and hot water from the door may cause fatal injury to the fireman or the front brakeman riding on the leading box car.

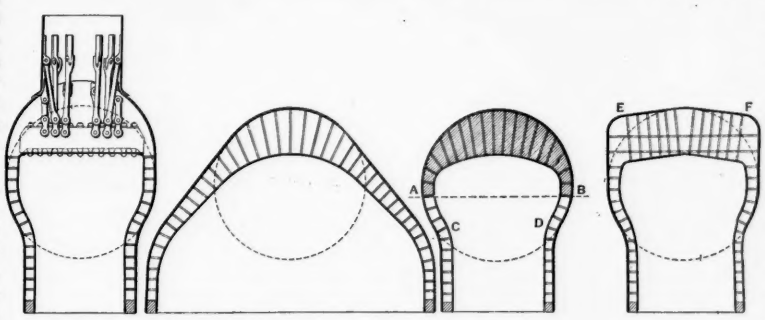



*Fig. 1.* *Fig. 2.* *Fig. 3.* *Fig. 4.*

Sections of Typical Fireboxes—Sanderson.

When considering the causes of broken staybolts it must be plain that even if a ⅞-in. screwed staybolt support 20 sq. in., and carry 180 lbs. per square inch there is a factor of safety of 5 to 1. The steam pressure alone would never break staybolts, but of course assists other causes in breaking them. Alternating movement of the firebox sheets producing repeated bendings of the staybolts is the prime cause of broken staybolts. This movement may be due to: 1st, varying or unequal support; 2d, the hogging or distortion of the boiler by the pressure on account of unstable form, which two causes are occasionally in evidence, but can be avoided by proper design; and 3d, to the continual contraction and expansion due to changing temperature; this is always there and must be reckoned with.

Concerning unequal support for the crownsheet: First, referring to the cross-section of a crownbar boiler, Fig. 1, it must be admitted by those who are familiar with practical boiler making that there are a great many chances for unequal strains on the crown and side sheets, due to unavoidable defective workmanship. The toes of the crownbars may not all have an equally solid bearing on the sheets; some may not actually touch; the thimbles may not be all the same thickness; the undersides of the crownbars not be perfectly straight; the pins connecting the sling stays with the crownbars may not be perfectly tight in the holes; the sling stays themselves cannot be made of correct length, absolutely, unless the holes in the stays and brackets are reamed out in place; how often is this done? Any and all of these imperfections will cause what may be called soft places, where the support is less rigid than at others, which will produce movement and straining with each change of pressure and temperature, tending to cause broken stays and cracked sheets. Then further, consider the water surface of the firebox covered with only $\frac{1}{16}$ in. of hard scale, nothing unusual. Yet this, as experiments have shown, owing to its poor conductive qualities, may cause a difference in temperature between the firebox and shell sheets of as much as 200 deg. Fahr. Under such conditions, as the firebox is riveted fast to the shell at the mud ring, the expansion must go upward, raising the crownsheet so that the sling stays may be quite slack if the crownbars are stiff enough. The enormous downward pressure of the steam on the crownsheet may be wholly or partly actually supported by the thin side sheets, which depend on the staybolts for maintaining their position. The very strong expressions of opinion by prominent men in favor of the radial stay construction as preferable to the crownbar construction no doubt were due to knowledge of these inherent weaknesses of the crownbar method of firebox bracing.

Referring next to Fig. 2 illustrating a cross-section of a Wooten firebox, which by the bye it seems was the "radial stayed" firebox referred to by the Commissioner as being in his opinion somewhat unsafe; if we consider this cross-section as a bent flexible tube closed at both ends and introduce a pressure into it, it will have a tendency to straighten out, just as a Bourdon tube straightens out and as a glove straightens out when blown into. Also if we consider the firebox sheets coated with scale and a difference of temperature of 200 deg. or thereabouts as existing between the firebox and shell sheets, the resulting lengthening of the firebox sheets will also have a tendency to spread the firebox out, so that both the steam pressure and the expansion tend to distort the cross-section in the same direction. These forces at work are enormous, and must produce constant slight changes of form with excessive strains locally on both sheets and stays with continual alternating bendings of the staybolts. It is not a stable form, and since the forces producing distortion are there and must be reckoned with, the boiler should be designed so that they can expend their energies harmlessly, which is evidently not the case with the crownbar or Wooten construction.

Referring next to Fig. 3 representing a cross-section of a radial-stayed boiler, which the Commissioner did not seem to have in mind at all; the shaded portion above *A B* is an absolutely rigid construction incapable of giving in any direction—an arch of the stiffest kind—the steam pressure can have little or no tendency toward distortion. Yet if the firebox sheets are covered with scale and must expand more than the shell sheets, where is this expansion to go to? It cannot go upward; the arch above *A B* will not let it; it cannot go downward on account of the mud ring. Is it any wonder, then, that with bad water we are continually troubled with broken staybolts at *C* and *D* and with bulged and cracked sheets at the same places, which are the only points where the straining due to expansion can expand itself? Is it any wonder that the flue sheet is crushed and flue holes flattened along the lines of least resistance unless articulated stays are used next to the flue sheet, introducing fresh difficulties of the same kind as those mentioned when discussing the crownbar construction?

Referring further to Fig. 4 representing a cross-section of a Belpaire firebox, it will be noticed that the strain due to the steam pressure on the stays and crown bolts is direct tension and absolutely calculable, which is not the case with any of the other forms of construction. The upward and downward pressures on the roof and crownsheets are almost perfectly balanced and the sheets are practically in equilibrium at any pressure. If such a firebox be coated with scale the expansion will cause it to rise in the shell and it will lift the roof sheet with it, the curves *E F* springing a little, so that the expansive force can expand itself harmlessly, bending the shell sheets where they are able to stand it without injury. Experiments and measurements carefully made have shown that this does take place, a maximum rise of $\frac{1}{8}$ in. having been noted. It must always be remembered that the expansion of the firebox sheets is bound to occur more or less and if not provided for in the design will gradually and surely cause damage and destruction. Carefully made experiments have shown that to shorten a slightly corrugated round furnace by the small amount of $\frac{1}{32}$ of an inch required a pressure of 300 tons. It is hard to even guess what the pressure would have been if the sheets were flat instead of corrugated. Inversely it is certainly correct to assert that as the firebox sheets will under extreme conditions expand over $\frac{1}{16}$ in. more than the outer sheets, there is a force of over 300 tons, perhaps 500 or 600 tons, to be reckoned with. It can expend itself harmlessly at *E* or *F*, but will certainly produce broken stays and cracked or bulged sheets at *C D*, while it requires a very lively imagination to form any idea of how this force is absorbed and what results it produces on Fig. 2.

As the crownsheet in Fig. 4, and similar shapes must expand horizontally, it should be able to do so without unnecessary straining by pushing the shell side sheets out. For this reason the long, horizontal cross-stays should not be placed too close down to the top row of stays, as they will expand less than the crownsheet. As it is so vitally important that the outer shell should be free to breathe (to use Mr. Yarrow's phrase) and to avoid all local straining, it is certainly not good practice to support the back boiler head by gusset or rod braces attached to the roof sheet as at *G* or *H*, Fig. 5; they interfere with the free movement, or breathing, of the roof sheet and must cause local straining of the crown bolts and sheets. Leaky crownbolts are sometimes traceable to this method of bracing the back heads. Long rods running the entire length of the boiler are also objectionable, and it is believed that the best method of bracing the back heads is by stay rods attached to the first cylindrical sheet in front of the firebox and provided with turn-buckles and locks which can be got at to tighten up equally after they are in place. The tee irons or angles on the back heads must not be carried too close down to the top back row of staybolts, as the crownsheet also expands longitudinally; the flues also when expanding tend to force out the back boiler head, so that this must be free to breathe below the level of the crownsheet without local strainings.

We have also the longitudinal expansion of the firebox to provide for, and this for a 10-ft. firebox is very considerable. Judging from numerous modern boiler drawings this expansion does not seem to be considered by most of our designers, or if they have thought of it at all, it has been with the idea of preventing it, which is an impossibility. It can be very well provided for by making large easy curves at the corners as shown at *I* and *J* in Fig. 6, and not placing the staybolts too close to the corners. It is believed that fewer leaky flues would fall to our daily allowance of grief if the front flue sheets were also flanged with large easy bends and some flat surface provided between the outer tubes and commencement of the curve of the flange. The flexibility in the front flue sheet can be accomplished by drawing the flues closer together at the front, using $\frac{3}{4}$ bridges instead of $\frac{9}{16}$ or $\frac{5}{8}$ bridges as at the firebox flue sheet, by making the front flue sheet as thin as practicable and by not making the front ring of the shell the smallest, as is the very general practice. In this way the front flue sheet can be made to do some of the "breathing" to accommodate the varying expansion of the flues and relieve the firebox flue sheet, side sheets, staybolts and back head of some of these strains due to expansion.

In view of what has been written about providing for the expansion which *must* take place, it is hard to understand the line of reasoning which has led some designers to increase the number of staybolts at the places where they were most commonly found broken by spacing them $2\frac{1}{2}$ in. to 3 in. instead of 4 in. As they are broken by the repeated bendings and not by the pressure, the increased number was not necessary for strength and simply meant that many more to break and be replaced, for the expansion and contraction of the box cannot be prevented by these additional stays, and with it comes the bending backward and forward and ultimate cracking of the stays. By making the water spaces as wide as possible, so as to get longer staybolts, the breakage can be reduced. Experiments carefully made have shown that the life of a ⅞-in. staybolt can be prolonged from 27,000 vibrations of $\frac{1}{8}$ in. for a plain 12-thread staybolt to 90,000 vibrations of $\frac{1}{8}$ in. when turned down to the proper diameter between sheets, and it is believed that in this lies the best practice. Better make the staybolts as flexible as possible, let them do the flexing and replace them when they do break than attempt to prevent the expansion of the sheets from bending them, which can only result in local straining and cracked or buckled sheets.

It may be proper here to mention that this statement, that there can be a difference in temperature between the firebox and shell sheets of 200 deg., is founded on actual observations made by Mr. A. J. Durston, Chief Engineer of the British Navy, who found an actual difference of 348 deg. Fahr. between the hot side of a firebox plate ¼ in. thick and that of the water above it when the sheet was coated with deposit $\frac{1}{16}$ in. thick. It must also be remembered that if we add 348 deg. temperature to that of steam at 200 lbs. per square inch we get dangerously near to a blue heat, at which we know steel is not to be relied on to stand much hard usage without cracking.

When boilers were small and fireboxes were large, if they were $3\frac{1}{2}$ ft. long, boilermakers allowed 3 in. to 4 in. of water over the crownsheet to the bottom gage cock; they do the same to-day, regardless of the fact that the evaporating power of our boilers has quadrupled, while we ought, at least, to allow 6 in. Actual tests made by the writer with a boiler 60 in. diameter, firebox 10 ft. long, engine cylinders 20 × 24 in., showed that with the engine working hard and safety valves blowing, the crownsheet will commence to get dry in about $4\frac{1}{2}$ minutes after the water leaves the bottom gage cock, set 4 in. above the crownsheet, not a very long time for a man to neglect his injector to be sure. Again a crownsheet in a 60-in. boiler can well be 4 ft. 6 in. wide. The gage of the track is 4 ft. $8\frac{1}{2}$ in., and on sharp curvature elevations of 6 in. or 7 in. for the outer rail are not uncommon. It is easy to see that a man might have a gage and a half of water in a freight engine pounding slowly round a sharp curve and yet have the high side of his crownsheet partly dry. For this reason flat crownsheets, as shown in Fig. 1, are objectionable and it is

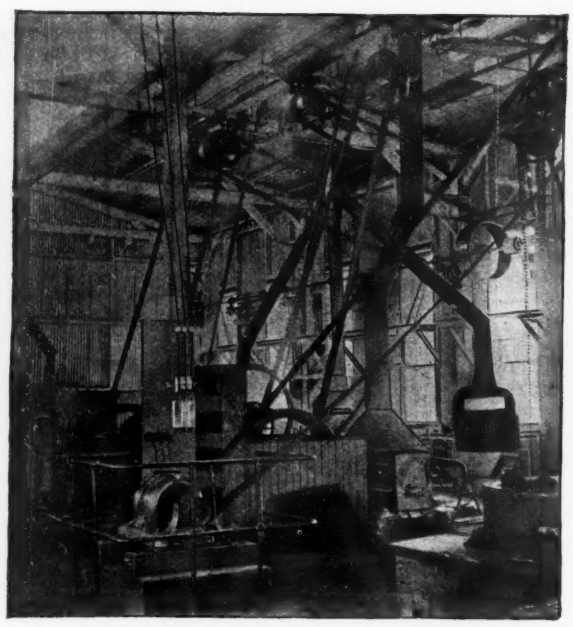
preferable to slope the Belpaire sheets as shown in Fig. 4.

As careless men and burned crownsheets will occur on the best-regulated railroads now and then, it is certainly better to arrange the crownsheet bracing so that when the sheet is burned the minimum amount of damage will occur. The writer has, therefore, advocated for several years that crownsheets, whether supported by radial or Belpaire stays, should have alternate, staggered, button-headed and screw-riveted crown stays. Actual experience has shown that the screw-riveted stays will let go first, allowing the sheet to bag down between the button heads, drown or blow out the fire and relieve the pressure; while actual observation has shown that crownsheets entirely supported by stays of equal holding power whether screw-riveted or button-headed are apt to all let go with a bang together with most disastrous results, and the longer they hold out the worse are the consequences.

### Electric Motors at the Sacramento Shops of the Southern Pacific.

The subject of the installation of electric motors designed to perform the work previously done directly by steam power is a live topic. At the last meeting of the American Society of Mechanical Engineers two papers were presented bearing on the general subject of the advantages of electrical installation, and it was evident from the discussion which followed their presentation that the change in many places had met with considerable favor. In the previous articles which we have published on the subject attention has been drawn to some of the advantages of electric motors, but as every plant has peculiarities of its own, the advantages gained in each case can be determined only by independent investigations. To this end we give a general description of the installation of electric motors for certain work at the Sacramento shops of the Southern Pacific Railroad, and this will be followed in subsequent issues by more detailed descriptions of electric motors in other railroad shops.

The completion of the long distance transmission line between Folsom and Sacramento, Cal., has made it possible for the railroad to use motors in their shops at the latter place. The motors are placed in the shops where steam engines had previously been used, and the difference between the results obtained apart from the mere question of economy is quite marked.



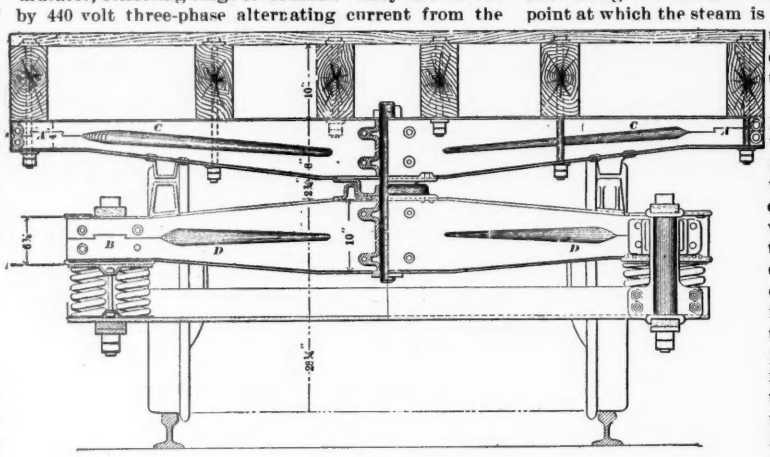
10-H. P. Motor Driving Machinery in the Sacramento Shops of the Southern Pacific Railroad.

In all, three motors are used, one of which is a direct current motor operating a transfer table used for shifting locomotives. This motor is a G. E. 800 type driven at a voltage of 500. It is so geared that it operates not only the table, but also drives a drum carrying a wire cable which is at times used to haul the locomotives upon the table. Instead of taking the current from the overhead wire, the conductors are laid in an underground conduit and the contact is made by means of a shoe fastened to a plow which runs in this conduit. Some fears were at first expressed as to the result in rainy weather, but no difficulty has been experienced, although considerable rain has fallen since the installation of this motor.

Two motors of 50-H. P. each are used to drive the machinery in the boiler and tender shops. These motors have an excessive amount of work thrown upon them from the time of starting the machines until they acquire the maximum speed. The load then drops to 30 H. P. With the induction motors used, this drop in the load is hardly noticeable.

The accompanying engraving shows the interior of the spring shop, driven by a 10-H. P. motor. This motor is also required to stand sudden heavy loads, for in the construction of the spiral springs bars of hot iron 1¼ in. in diameter are instantly wrapped around a mandril, throwing the load on the large fly-wheel and motor. Although the motor has been in use for some time it has not been injured or strained in any way.

The two last named motors are of the General Electric Company's three-phase induction type, without commutator, collecting rings or brushes. They are driven by 440 volt three-phase alternating current from the transformers which "step down" the 11,000 volt current transmitted 24 miles from the generating station at Folsom. This installation is only one of many that have been installed since the completion of the transmission plant.




The Bettendorf Steel Truck.

### The Bettendorf Steel Truck.

The engraving shows still another steel truck, the construction of which is quite apparent.

The I-beam bolsters are made of rolled steel (American Steel Manufacturers' specifications). The I-beam is reduced by two processes. At the extreme end at *A* and *B* a section is cut out in such a manner that when it is pressed together the upper and lower parts of the web interlock. At the same time the material from that point toward the center is corrugated at *C* and *D*. At the point where the portion is cut out and interlocked a butt weld is effected. From the center plate to the side bearings we have the full strength of the I-beam, and the fiber is not disturbed. The result is that the bolster when made up stands about the same load under the testing machine that the two I-beams stand before the reduction of the web. In the body bolster the lower member is pressed upward, the upper flange remaining horizontal.

The weight of the body bolster is 350 lbs., and it is adequate for an 80,000-lb. car. The weight of the truck bolster is 450 lbs. In a test of the truck bolster, made by Robert W. Hunt & Co., of Chicago, March 30, 1897, it showed no permanent set after a load of 100,000 lbs., and under a load of 150,000 lbs. it took a permanent set of only about ¼ of an inch. The maximum load was 179,800 lbs. In a test made at the works it took a permanent set of $\frac{15}{32}$ of an inch under a load of 180,000 lbs. When tested on its side it stood a load of 70,000 lbs. with $\frac{1}{32}$-in. set, and at 80,000 lbs. it took a permanent set of $\frac{5}{32}$ in. The body bolster when tested by Robert W. Hunt & Co. showed a permanent set of .02 of an inch under a load of 100,000 lbs. At 130,000 lbs. the permanent set was 1.01 in.

The parts of these bolsters are put together without the use of rivets, properly so-called. Tubular rivets are cast on the malleable iron parts. They pass through and are expanded in holes drilled in the steel, and are beaded down. It is claimed that any strain upon one is borne by all the parts, and that it will be impossible to shear a rivet. In case of repairs all that is necessary is to cut off the eyelet with a cold chisel and insert a rivet. In case of a wreck the bolsters can be repaired, as most of the parts could be used over again.

### The Cahall Boiler.

The Cahall boiler, one of the straight tube variety, brought out only four years ago, consists essentially of two drums, arranged one above the other and connected by 4-in. tubes in the manner shown in the accompanying illustration. The upper or steam drum has an opening through its center for the exit of the discharge gases. These, although reduced to a very low temperature in passing through the closely grouped tubes of the boiler, will impart most of their retained surplus heat to the metal sides of the passage through this upper drum, thereby tending to slightly superheat the steam in the chamber above. The water line in the upper drum is about a foot above the bottom of the drum, the latter itself being 5 ft. between the surface of the water and point at which the steam is drawn off from the boilers, thus tending to prevent the carrying over of water in the steam.

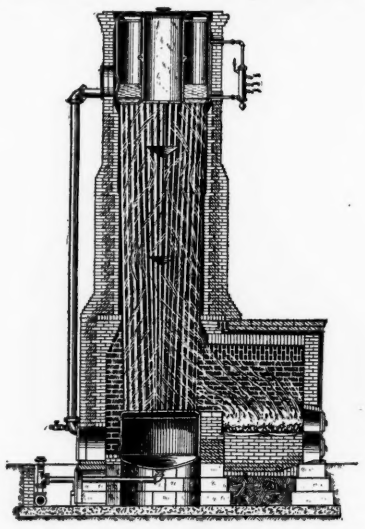
An external circulating pipe, shown in the illustration, comes out from the upper drum, just below the water level, and is carried downward, outside the brickwork, to a point just below the tube sheet of the lower drum, where it enters that drum. The boiler rests upon four iron brackets riveted to the lower or mud drum, supported upon four piers of the foundation, the entire structure standing without contact with the brickwork, allowing the boiler every freedom for expansion, without in any way straining the brick setting. In all places where pipe connections are made to the boilers through the walls, they are encased in expansion boxes.

Owing to the fact that the gases escape through the central opening in the upper drum, the upper tube-sheet has a circular opening in its center, leaving a central open space between the tubes, which gradually narrows to the bottom tube sheet. Advantage is taken of this space, which is in the form of an inverted cone, to introduce deflecting plates, which in connection with corresponding baffles or offsets in the brick casing cause the gases to be alternately thrown out and in throughout the whole heating surface, giving them a sweep at nearly right angles to the tubes, which extract from these gases their heat, until they come to very nearly the temperature of the water contained in the boiler

Access to the interior of the drum is gained through manholes, closed by swinging covers of special design. The upper drum is large enough for a man to get in and walk around, so that the tubes may be easily examined and scale removed if necessary. The scraper used for cleaning the tubes is made in sections a trifle less than 6 ft. long. Four of these sections are used, and the man who is cleaning the boiler takes them into the drum and pushes the first section down as far as it will go, then simply attaches the second section to that, and continues doing this until the scraper has gone entirely through the tube, forcing any scale that may have been deposited on the sides of the tube straight through to the bottom drum.

Ample provision is also made for removing defective tubes from the boiler. To this end the top part of the upper drum has 12 hand holes, besides two others for steam pipe and pop valve connections. By means of these 14 openings any of the tubes needing removal, after having been cut loose from the tube sheets, can be pushed up through the tube hole from which it has just been cut and through the most convenient of these openings in the top head, and removed from the boiler. The new tube to replace the defective tube is passed into the boiler through the same openings.

The Cahall Vertical Boiler is manufactured by the Aultman & Taylor Machinery Co., Mansfield, O., who also build boilers of the Babcock & Wilcox type to go in places where head room is not available to accommodate the Cahall Vertical. The builders claim that the vertical boiler will show an efficiency, all conditions being the same, of five per cent. above that shown by the horizontal boiler. The shops of the company have a capacity of 200,000 H. P. Cahall vertical boilers a year and are also able to turn out 100,000 H. P., of the Babcock & Wilcox type in the same time.



The Cahall Boiler.

| Date. | Railroad. | From | To. | Dist. Miles. | Time, h. m. s. | Speed Miles per H. | Stops. | Net Speed Miles per H. | CARS. No. | CARS. Weig't | Weig't of Train. | LOCOMOTIVES. Name or Number. | Type. | Cylinders. | Drivers. No. | Drivers. Diam. Inches | Weight on Drivers | Engine Weight. | Builder. | Date Reported in RAILROAD GAZETTE. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| June 14, '80 | P. R. R. | Phila. | J. City | 90 | 1:33:00 | 58.06 | 4 | ..... | 2 | ..... | ..... | 724 | ..... | ..... | .. | .. | ..... | ..... | ..... | June 25, '80 |
| " | " | Trenton | N. Br'nsw'k | 26 | 0:24 00 | 65 | 0 | 65 | 2 | ..... | ..... | " | ..... | ..... | .. | .. | ..... | ..... | ..... | " |
| 1880 | Gt. N. (Eng.) | London | Grantham | 105.5 | 1:51:00 | 66.5 | 0 | 66.5 | .. | ..... | ..... | ..... | ..... | ..... | 2 | 96 | ..... | ..... | ..... | Aug. 6, '80 |
| ..... | G. W. (Eng.) | London | Swindon | 77.25 | 1:27:00 | 53.3 | .. | ..... | .. | ..... | ..... | ..... | ..... | ..... | .. | .. | ..... | ..... | ..... | Dec. 8, '82 |
| Sept. 9, '81 | P. R. R. | Princeton | ..... | 1 | 0 00:50 | 72 | 0 | 72 | .. | ..... | ..... | ..... | ..... | ..... | .. | .. | ..... | ..... | ..... | Mar. 2, '83 |
| Apr. 22, '82 | W. Jersey | Camden | Cape May | 81.5 | 1:23:30 | 58.63 | 0 | 58.63 | 3 | ..... | ..... | 22 | C | ..... | .. | .. | ..... | ..... | ..... | Apr. 28, '82 |
| " | " | Westville | " | 76.1 | 1:16:00 | 60.11 | 0 | 60 11 | 3 | ..... | ..... | " | " | ..... | .. | .. | ..... | ..... | ..... | " |
| May 15, '83 | P. R. R. | N. Y. Div. | ..... | 11 | 0.09:52 | 66 89 | 0 | 66.89 | 4 | ..... | ..... | 184 | K | ..... | .. | .. | ..... | ..... | ..... | May 18, '83 |
| July 12, '83 | S. B. & N. Y. | Syracuse | B'hamton | 79 | 1:23:00 | 57.11 | 1 | ..... | 2 | ..... | ..... | 6 | ..... | ..... | .. | .. | ..... | ..... | ..... | July 20, '83 |
| Apr. 20, '84 | C., N. O. & T. P. | Cinn. | N. Orleans | 826 | 23:20:00 | 35.4 | .. | 41.7 | .. | ..... | ..... | ..... | ..... | ..... | .. | .. | ..... | ..... | ..... | Apr. 25, '84 |
| May 9, '84 | P. & R. | N. Y. Div. | M. P. 48 | 14 | 0:11:19 | 74 2 | 0 | 74.2 | 4 | ..... | ..... | 364 | ..... | ..... | .. | .. | ..... | ..... | ..... | Jan. 6, '84 |
| " | " | " | " 44 | .1 | 0.00 46 | 78.3 | 0 | 78.3 | 4 | ..... | ..... | " | ..... | ..... | .. | .. | ..... | ..... | ..... | " |
| June 7, '84 | B. & O. | Belmont | Warnock | 6 | 0:04:00 | 90 | 0 | 90 | 5 | ..... | ..... | 727 | ..... | ..... | .. | .. | ..... | ..... | ..... | June 20, '84 |
| May 8, '85 | L. S. and N. Y. C. | Chicago | New York | 964 | 22 45:00 | 42.38 | .. | ..... | .. | ..... | ..... | ..... | ..... | ..... | .. | .. | ..... | ..... | ..... | May 15, '85 |
| July 9, '85 | W. Shore | E. Buffalo | Weehawken | 422.6 | 9:23:00 | 45.04 | 20 | 54.06 | 3 | 153,660 | 310,960 | 45 & 50 | B, A | 18×24 | 4 | 68 | 62,500 | 94,500 | ..... | Aug. 28, '85 |
| " | " | " | Frankfort | 201.7 | 4:00:00 | 50.42 | 8 | 60.21 | 3 | " | " | " | " | " | " | " | " | " | ..... | " |
| " | " | Alabama | Gen Junc. | 36.3 | 0:30 00 | 72 60 | 0 | 72 60 | 3 | " | " | " | " | " | " | " | " | " | ..... | " |
| Mar. 8, '86 | Gt. N. (Eng.) | London | Grantham | 105.25 | 1:57.00 | 54 | 0 | 54 | 8 | ..... | 420,000 | ..... | ..... | 18×28 | 2 | 98 | 40,300 | 101,000 | ..... | Mar. 30, '88 |
| May 16, '86 | N. Y. C. & H. R. | Syracuse | Rochester | 81 | 1:25 00 | 57.18 | 0 | 57.18 | 2 | ..... | ..... | 338 | ..... | ..... | .. | .. | ..... | ..... | ..... | May 21, '86 |
| June 17, '86 | C., B. & Q. | Princeton | Burlington | 170 | 2 58 00 | 57.3 | 0 | 57.3 | .. | ..... | ..... | ..... | ..... | ..... | .. | .. | ..... | ..... | ..... | July 2, '86 |
| July 5, '86 | Wabash | K. City | Peru | 563 | 13:45.00 | 41 | .. | ..... | .. | ..... | ..... | 29 | ..... | ..... | .. | .. | ..... | ..... | ..... | July 16, '86 |
| Aug. 8, '86 | N. Y. C. & H. R | Syracuse | Fairport | 70.25 | 1:01:20 | 68.73 | 0 | 68.73 | 2 | ..... | ..... | 541 | ..... | ..... | .. | .. | ..... | ..... | ..... | Aug. 13, '86 |
| June, '87 | Vandalia | Highland | C'ville | 18.7 | 0:16:00 | 70.12 | .. | ..... | .. | ..... | ..... | ..... | ..... | ..... | .. | .. | ..... | ..... | ..... | June 24, '87 |
| July 10, '88 | L. & N. W.(Eng.) | London | Crewe | 158 | 2:58.00 | 53 26 | 0 | 53.26 | 4 | ..... | 295,000 | ..... | ..... | 16×24 | 2 | 90 | 26,000 | 60.000 | ..... | Aug. 10, '88 |
| ..... | Caled. (Eng.) | Carlisle | Edinb'ro | 101 | 1 44 00 | 58.27 | .. | ..... | .. | 179,000 | 348,000 | ..... | ..... | 18×26 | 2 | 84 | 38,000 | 94,000 | Neilson | Oct. 5, '88 |
| " | " | London | " | 400 | 7:52 00 | 50 85 | .. | 55.43 | .. | ..... | ..... | ..... | ..... | ..... | .. | .. | ..... | ..... | ..... | " |
| August, '88 | L. & N. W. & C. | Crewe | Preston | 51 | 0:50 00 | 61.20 | 0 | 61.20 | .. | ..... | 348,000 | ..... | ..... | ..... | .. | .. | ..... | ..... | ..... | Aug. 24, '88 |
| " | " | Preston | Carlisle | 90 | 1 30 00 | 60 | 0 | 60 | .. | ..... | ..... | ..... | ..... | ..... | .. | .. | ..... | ..... | ..... | " |
| Aug. 9, '88 | Caledonian | Carlisle | Edinb'ro | 109.75 | 1 42 33 | 58 95 | 0 | 58.95 | 4 | ..... | ..... | 123 | ..... | 18×26 | 2 | 84 | ..... | 83,800 | ..... | ..... |
| August, '88 | Gt. N. (Eng.) | London | N'castle | 272 | 4 56 00 | 55 1 | 0 | 55.1 | .. | ..... | 296,000 | ..... | ..... | ..... | .. | .. | ..... | ..... | ..... | Aug. 24, '88 |
| " | " | Preston | Carlisle | 90 | 1 30 00 | 60 | .. | ..... | .. | ..... | ..... | ..... | ..... | ..... | .. | .. | ..... | ..... | ..... | " |
| " | " | Crewe | Preston | 51 | 0:50 00 | 61.2 | .. | ..... | .. | ..... | ..... | ..... | ..... | ..... | .. | .. | ..... | ..... | ..... | " |
| Aug. 30, '88 | N. W. (Eng ) | York | N'Castle | 80.5 | 1:18:00 | 62 | .. | ..... | 7 | ..... | 343,000 | ..... | ..... | 18×24 | 2 | 84 | ..... | ..... | ..... | Dec. 14, '88 |
| Aug. 31, '88 | Gt. N. (Eng.) | London | Edinb'ro | 392.5 | 7 26 45 | 52.7 | .. | 57.8 | .. | ..... | " | ..... | ..... | ..... | .. | .. | ..... | 73,000 | ..... | Oct. 5, '88 |
| " | " | ..... | ..... | 4 | 0 03 87 | 76.3 | 0 | 76.3 | .. | ..... | ..... | ..... | ..... | ..... | .. | .. | ..... | " | ..... | " |
| Mar. 10, '89 | P. W. & B. | Washingt'n | G. Ferry | 134.1 | 2 29 10 | 54 | .. | ..... | 3 | ..... | ..... | ..... | 35 P | 18½×24 | .. | .. | ..... | ..... | ..... | Mar. 28, '90 |
| Apr. 8, '89 | C. & N. W. | Chicago | C. Bluffs | 490 | 12 30 00 | 39.2 | .. | 42 | 4 | ..... | ..... | 274 | 8 W | 18 ×24 | 4 | 63 | 59,850 | ..... | C. & N. W. | ..... |
| May 19, '89 | P., F. W. & C. | Ft. Wayne | Chicago | 148.3 | 3:59:00 | 49 7 | .. | 56 3 | 5 | ..... | 438,500 | ..... | " | " | 4 | 62 | ..... | 91,900 | ..... | ..... |
| " | " | ..... | ..... | 29 2 | 0 27 00 | 64 9 | 0 | 64.9 | 5 | ..... | " | ..... | ..... | ..... | 4 | " | ..... | " | ..... | ..... |
| May 26, '89 | Mich C. | S. Bridge | Chicago | 511 | 11:41 00 | 43.74 | .. | ..... | .. | ..... | ..... | ..... | ..... | ..... | .. | .. | ..... | ..... | ..... | June 6, '90 |
| Mar. 10, '90 | P. & R. | Phila. | J. City | 90 | 1:25 00 | 63.53 | 0 | 63.53 | 1 | ..... | ..... | ..... | ..... | ..... | .. | .. | ..... | ..... | ..... | Mar. 14, '90 |
| " | P. R. R. | J. City | Washingt'n | 226 | 4 18 00 | 52.56 | .. | ..... | 3 | ..... | ..... | ..... | ..... | ..... | .. | .. | ..... | ..... | ..... | " |
| " | " | Washingt'n | J. City | 226 | 4:19 00 | 52 35 | .. | ..... | 3 | ..... | ..... | ..... | ..... | ..... | .. | .. | ..... | ..... | ..... | " |
| Mar. 11, '90 | B. & O. | Baltimore | Phila. | 92 | 1:46 00 | 51.9 | .. | ..... | .. | ..... | ..... | ..... | V. comp. | ..... | .. | .. | ..... | ..... | Baldwin | ..... |
| July 26, '90 | P. & R. | Skillmans | B. Meade | 4.1 | 2:30 | 98.4 | 0 | 98.4 | .. | ..... | ..... | ..... | ..... | ..... | .. | .. | ..... | ..... | ..... | Dec. 30, '92 |
| Nov., '90 | N. Ry. (France) | Paris | Calais | 184.6 | 3 53 00 | 47.53 | .. | ..... | .. | ..... | ..... | ..... | ..... | ..... | .. | .. | ..... | ..... | ..... | ..... |
| June 22, '91 | N. Y. C & H. R. | New York | Buffalo | 439.52 | 8:58 00 | 49.2 | .. | 51 31 | 6 | 515,700 | 717,500 | 870 | 8 W | 19 ×24 | 4 | ..... | ..... | 121,300 | ..... | June 26, '91 |
| Aug. 27, '91 | P. & R. | Noble | L'horne | 12 | 0 08 00 | 82.73 | 0 | 82 73 | .. | ..... | 337,250 | 206 | 8 W | 18½×22 | 4 | 68 | ..... | 98,000 | ..... | Sept. 4, '91 |
| " | " | ..... | ..... | 5 | 0 03 27 | 86.96 | 0 | 86.96 | .. | ..... | " | " | " | " | 4 | " | ..... | " | ..... | " |
| August, '91 | C. Pac. | Vancouver | Brockville | 2,792 | 76:31 00 | 36.49 | 22 | 39 19 | 3 | ..... | ..... | ..... | ..... | ..... | .. | .. | ..... | ..... | ..... | Sept. 18, '91 |
| " | " | Pt. Arthur | " | 891 | 22 25 00 | 39.7 | 7 | 41.51 | 3 | ..... | ..... | ..... | ..... | ..... | .. | .. | ..... | ..... | ..... | " |
| Sept. 14, '91 | N. Y. C. & H. R. | New York | E. Buffalo | 436.32 | 7 17:30 | 59 56 | 3 | ..... | .. | ..... | ..... | 870 | ..... | 19 ×24 | 4 | ..... | ..... | ..... | ..... | " |
| " | " | Fairport | " | 75.17 | 1:11 00 | 62 70 | 0 | 62.70 | .. | ..... | ..... | " | ..... | " | 4 | ..... | ..... | ..... | ..... | " |
| " | " | Albany | Syracuse | 147.84 | 2 26 00 | 60.75 | 0 | 60.75 | .. | ..... | ..... | " | ..... | " | 4 | ..... | ..... | ..... | ..... | " |
| " | " | Syracuse | E. Buffalo | 145.6 | 2.19:44 | 62.52 | 0 | 62.52 | .. | ..... | ..... | " | ..... | " | 4 | ..... | ..... | ..... | ..... | " |
| " | " | New York | Albany | 142.88 | 2 20:00 | 61.23 | 0 | 61.23 | .. | ..... | ..... | " | ..... | " | 4 | ..... | ..... | ..... | ..... | " |
| Oct. 16, '91 | N. Ry. (France) | Paris | Calais | 184 | 3:43:00 | 49.51 | .. | 53.3 | 12 | 311,360 | 470,400 | ..... | 4c. comp. | 13¼/20¾×25 | 4 | 84 | 67,200 | 96,320 | Soc. Als. | ..... |
| Nov. 1, '91 | Mich C. | Chicago | Detroit | 285.5 | 5:59 00 | 47.7 | .. | 51.6 | 4 | ..... | ..... | 256 | ..... | 18×24 | .. | .. | ..... | ..... | M. C. R. R. | Nov. 6, '91 |
| Nov. 28, '91 | P. R. R. | J. City | Washingt'n | 227 | 4:11:00 | 54.22 | 2 | 56.75 | 3 | 250,000 | 403,000 | 340 | ..... | ..... | .. | .. | ..... | ..... | ..... | Dec. 4, '91 |
| " | " | " | G. Ferry | 91 | 1:28:00 | 62 | .. | ..... | 3 | " | " | 181 | ..... | ..... | .. | .. | ..... | ..... | ..... | " |
| " | " | " | Trenton | 56 | 0:53 00 | 63 4 | .. | ..... | 3 | " | " | " | ..... | ..... | .. | .. | ..... | ..... | ..... | " |
| Nov., '91 | Can. P. | S. Falls | Montreal | 127 | 2:00 00 | 63 5 | .. | ..... | .. | ..... | ..... | ..... | ..... | ..... | .. | .. | ..... | ..... | ..... | ..... |
| Dec. 22, '91 | B. & O. | Phila. | Canton | 91 6 | 1:41 00 | 54.41 | .. | ..... | .. | ..... | ..... | ..... | V. comp. | ..... | .. | .. | ..... | ..... | Baldwin | Jan. 1, '92 |
| " | " | Baldwin | Leslie | 7.5 | 0 06:00 | 75 | .. | ..... | .. | ..... | ..... | ..... | " | ..... | .. | .. | ..... | ..... | " | " |
| Feb. 26, '92 | Cent. N. J. | J. City | Phila. & ret. | 180 | 4:25:00 | 40.75 | .. | 47.16 | 4 | 222,920 | 428,720 | 385 | " | 13/22×24 | 4 | 78 | 88,400 | 123,800 | " | ..... |
| " | " | ..... | ..... | 1 | 0:00:39½ | 91.7 | .. | 91.7 | 4 | " | " | " | " | " | 4 | " | " | " | " | ..... |
| Mar. 28, '92 | N. Y. C. & H. R. | Oneida | De Witt | 21.37 | 0:17:40 | 72.69 | .. | ..... | .. | ..... | 530.000 | 870 | 8 W | 19×24 | 4 | " | 81,400 | 126,150 | ..... | Apr. 7, '93 |
| Oct. 29, '92 | N. Ry. (France) | Amiens | Paris | 81.5 | 1:27:30 | 55.6 | .. | ..... | .. | ..... | ..... | 2122 | ..... | ..... | .. | .. | ..... | ..... | ..... | ..... |
| Nov. 8, '92 | N. Y. C. & H. R. | Syracuse | Utica | 51.67 | 0 46 00 | 67.38 | 0 | 67.38 | .. | ..... | ..... | ..... | 8 W | ..... | .. | .. | ..... | ..... | ..... | June 2, '93 |
| " | " | Ch'nango | Schenect'dy | 116.16 | 1:50.00 | 63.38 | 0 | 63 38 | .. | ..... | ..... | ..... | " | ..... | .. | .. | ..... | ..... | ..... | ..... |
| Nov. 18, '92 | Cent. N. J. | Fanwood | ..... | 1 | 0:00:37 | 97.3 | 0 | 97.3 | 4 | 228,800 | 434,000 | 385 | V. comp. | 13/22×24 | 4 | 78 | 88,400 | 123,800 | Baldwin | Nov. 25, '92 |
| " | P. & R. | J'kintown | L'horne | 5 | 0:03 25 | 87.8 | 0 | 87.8 | .. | ..... | ..... | ..... | ..... | ..... | .. | .. | ..... | ..... | ..... | ..... |
| Dec., '92 | L. & N. W. | Crewe | Rugby | 76 | 1 11 00 | 64.23 | .. | ..... | 3 | ..... | ..... | C. Place | ..... | ..... | .. | .. | ..... | ..... | ..... | ..... |
| " | " | Stafford | " | 56 | 0:42:00 | 80 | 0 | 80 | .. | ..... | ..... | ..... | ..... | ..... | .. | .. | ..... | ..... | ..... | ..... |
| Apr. 17, '93 | " | Rugby | Crewe | 76 | 1:18 30 | 57.71 | .. | ..... | .. | ..... | ..... | ..... | ..... | ..... | .. | .. | ..... | ..... | ..... | ..... |
| May 9, '93 | N. Y. C. & H. R. | Grimesville | ..... | 1 | 0 00 35 | 102.8 | 0 | 102.8 | 4 | ..... | ..... | 999 | 8 W | 19×24 | 4 | 86 | 84,000 | 124,000 | N. Y. C. | June 2, '93 |
| May 19, '93 | " | Syracuse | E. Buffalo | 146 | 2 21 00 | 62.13 | .. | 64.9 | .. | ..... | ..... | 903 | " | " | 4 | 84 | " | " | " | May 26, '93 |
| " | " | Looneyville | Grimesville | 5 | 0.03.00 | 100 | 0 | 100 | .. | ..... | ..... | " | " | " | 4 | " | " | " | " | " |
| May 28, '93 | N. Y. C. & H R. / L. S. & M. S. | New York | Chicago | 964 | 19:57.00 | 48.2 | 10 | ..... | .. | ..... | 557,000 / 672,000 | ..... | " | 17×24 | 4 | 72 | 65,100 | 104,600 | ..... | June 2, '93 |
| Aug. 28, '93 | P., C., C. & St. L. | Ind'napolis | Louisville | 109.96 | 2 20:30 | 46.64 | .. | ..... | 5 | ..... | ..... | 120 | P | ..... | 4 | 68 | ..... | ..... | ..... | Aug. 15, '93 |
| " | " | Seymour | N. Tower | 42 | 0:35 34 | 70.96 | 0 | 70.96 | 5 | ..... | ..... | " | " | ..... | 4 | " | ..... | ..... | ..... | " |
| Mar. 23, '94 | C. & N. W. | C. Bluffs | Chicago | 488 | 12:52 00 | 41.1 | .. | 45.6 | 8 | ..... | ..... | ..... | ..... | ..... | .. | .. | ..... | ..... | ..... | Apr. 6, '94 |
| Apr. 17, '94 | L. S. & M. S. | Cleveland | Erie | 95.5 | 1:35:00 | 60.32 | 1 | 62.97 | .. | ..... | ..... | 188 | ..... | ..... | 6 | ..... | ..... | ..... | Brooks | Apr. 27, '94 |
| " | " | C'wood | Saybrook | 42 | 0:36:00 | 70 | 0 | 70 | .. | ..... | ..... | " | ..... | ..... | 6 | ..... | ..... | ..... | " | ..... |
| Aug. 26, '94 | A. C. Line | J'sonville | Washingt'n | 780.8 | 15:49:00 | 49.36 | .. | ..... | .. | ..... | ..... | ..... | ..... | ..... | .. | .. | ..... | ..... | ..... | Sept. 21, '94 |
| Jan. 27, '95 | C., C., C. & St. L. | DeGraff | B'fontaine | 9.4 | 0:10:15 | 55.02 | 0 | 55.02 | 6 | 548,000 | ..... | 198 | 8 W | 18½×24 | 4 | 62 | 79,700 | ..... | ..... | Mar. 1, '95 |
| March, '95 | C., B. & Q. | Chicago | G'burg | 162.5 | 3:16:00 | 49.7 | 3 | 51.9 | .. | 750,000 | 955,000 | ..... | Mogul | 19 ×24 | 6 | 69 | 106,500 | 125,000 | ..... | Mar. 8, '95 |
| " | " | G'burg | C. Bluffs | 335.8 | 8.00:00 | 41 9 | .. | ..... | .. | 643,000 | 823,000 | ..... | 8 W | 18 ×24 | 4 | 69 | 66,000 | 100,000 | ..... | ..... |
| " | C. & N. W. | Chicago | " | 488.5 | 11:22:30 | 43.2 | .. | ..... | 3 | ..... | ..... | ..... | 8 W | 17 ×24 | 4 | 69 | ..... | 84,800 | ..... | ..... |
| April, '95 | C., B. & Q. | " | G'burg | 163 | 2:45.00 | 59.27 | .. | ..... | 6 | ..... | ..... | 512 | Mogul | 19 ×24 | 6 | 68 | 101,000 | 120,000 | Rogers | Dec. 13, '95 |
| Apr. 21, '95 | Atl. City | Camden | A. City | 58.3 | 0:45:45 | 76.46 | 0 | 76.46 | 1 | ..... | ..... | 1,658 | 8 W | ..... | 4 | 78 | 87.300 | 122,600 | P. R. R. | May 3, '95 |
| " | " | L. Park | Absecom | 49.8 | 0:37.30 | 79.7 | 0 | 79.7 | 1 | ..... | ..... | " | " | ..... | 4 | " | " | " | " | " |
| " | " | Winslow | " | 24.9 | 0:18:06 | 83 | 0 | 83 | 1 | ..... | ..... | " | " | ..... | 4 | " | " | " | " | " |
| " | " | ..... | ..... | 1 | 0.00:41 | 87.8 | 0 | 87.8 | 1 | ..... | ..... | " | " | ..... | 4 | " | " | " | " | " |
| Aug. 19, '95 | L. & N. W. (Eng.) | London | Carlisle | 299.25 | 5:03.00 | 59.24 | 1 | 60.25 | .. | 268,800 | ..... | 1,309 | Webb c | 14×24 / 30×24 | 4 | 85 | ..... | ..... | ..... | Sept. 13, '95 |
| " | Caledonian | Carlisle | Aberdeen | 240.75 | 4:08:30 | 58.13 | 2 | 60.62 | .. | ..... | ..... | 78 | 8 W | 18×26 | 4 | 78 | 69,440 | 101,920 | ..... | ..... |
| " | " | Perth | " | 90 75 | 1:28:30 | 61.53 | 0 | 61.53 | .. | 179,300 | ..... | 78 | 8 W | " | 4 | " | " | " | ..... | ..... |
| " | " | London | " | 540 | 9:14:30 | 58.43 | 4 | 60.17 | .. | ..... | ..... | ..... | ..... | ..... | .. | .. | ..... | ..... | ..... | ..... |
| " | Gt. N. | " | Grantham | 105.3 | 1:46:30 | 59.25 | 0 | 59.25 | .. | 236,240 | ..... | 668 | ..... | 19½×28 | 2 | 96 | ..... | ..... | ..... | Sept. 13, '95 |
| " | " | Grantham | York | 82.75 | 1:19.30 | 62 45 | 1 | 65.33 | .. | " | ..... | 775 | ..... | " | 2 | " | ..... | ..... | ..... | " |
| " | N. Eastern | York | Edinb'ro | 204.5 | 3:32:00 | 57.88 | 2 | 59.85 | .. | " | ..... | 1,621—4 | ..... | 19×26 | 4 | 84 | ..... | ..... | ..... | " |
| " | N. British | Edinb'ro | Aberdeen | 130.5 | 2:35:00 | 50.52 | .. | 52.55 | .. | " | ..... | 293 & 262 | ..... | 18×26 | 4 | 78 | ..... | ..... | ..... | " |
| " | ..... | London | " | 523 | 9:31:00 | 54.95 | .. | 58 | .. | ..... | ..... | ..... | ..... | ..... | .. | .. | ..... | ..... | ..... | " |
| Aug. 21, '95 | West Coast | " | " | 540 | 8:55:00 | 60.56 | 4 | ..... | .. | ..... | ..... | ..... | ..... | ..... | .. | .. | ..... | ..... | ..... | " |
| " | East Coast | " | " | 523 | 8:40.00 | 60.25 | 5 | 61.77 | .. | ..... | ..... | ..... | ..... | ..... | .. | .. | ..... | ..... | ..... | " |
| " | N. E. | Newcastle | Edinb'ro | 124.25 | 1:52:30 | 66.26 | 0 | 66.26 | .. | ..... | ..... | ..... | ..... | ..... | .. | .. | ..... | ..... | ..... | " |
| " | Gt. N. | Grantham | York | 82.75 | 1:17:00 | 64.48 | 0 | 64.48 | .. | 224,000 | ..... | ..... | ..... | ..... | .. | .. | ..... | ..... | ..... | " |
| Aug. 22, '95 | L. & N. W. | London | Crewe | 158 | 2:27:30 | 64.24 | 0 | 64.24 | .. | 150,800 | ..... | Adriatic | Webb c | 14×24 / 30×24 | 4 | 85 | ..... | ..... | ..... | " |
| " | " | Crewe | Carlisle | 141.25 | 2:05:30 | 67.5 | 0 | 67.5 | .. | " | ..... | Hardw'ke | 8 W | 17×24 | 4 | 78 | ..... | ..... | ..... | " |
| " | Caledonian | Carlisle | Aberdeen | 240.75 | 3:56:30 | 61.08 | 1 | 61.6 | .. | " | ..... | 90 | 8 W | 18×26 | 4 | 78 | ..... | ..... | ..... | " |
| " | West Coast | London | " | 540 | 8:32:00 | 63.24 | 3 | 63.93 | .. | ..... | ..... | ..... | ..... | ..... | .. | .. | ..... | ..... | ..... | " |
| Sept. 8, '95 | L. & N. W. | " | Carlisle | 299 25 | 5:53:00 | 51 | 0 | 51 | 7 | 336,000 | ..... | Ionic | Comp. | ..... | .. | .. | ..... | ..... | ..... | Sept. 27, '95 |
| Sept. 11, '95 | N. Y. C. & H. R. | New York | Albany | 142.88 | 2:14:25 | 63.79 | 0 | 63.79 | .. | ..... | 565,000 | 870 | 8 W | 19×24 | 4 | 84 | ..... | ..... | ..... | " |
| " | " | Albany | Syracuse | 147.84 | 2:20:25 | 63.17 | 0 | 63.17 | .. | ..... | ..... | 999 | 8 W | 19×24 | 4 | 86 | 84,000 | 124,000 | N. Y. C. | " |
| " | " | Syracuse | E. Buffalo | 145.6 | 2:12 51 | 65.75 | 0 | 65.75 | .. | ..... | ..... | 903 | 8 W | 19×24 | 4 | 84 | 84,000 | 124,000 | " | " |
| " | " | New York | " | 436.32 | 6:51:56 | 63.54 | 3 | 64.22 | .. | ..... | ..... | ..... | ..... | ..... | .. | .. | ..... | ..... | ..... | " |
| Sept. 18, '95 | P. R. R. | J. City | Phila. | 80.6 | 1:39:45 | 53 88 | .. | ..... | 7 | 663,820 | 868,620 | 1,651 | L | 18½×26 | 4 | .... | 91,600 | 134,800 | ..... | Dec. 13, '95 |
| Sept. 24, '95 | N. Y. C. & H. R. | Albany | Syracuse | 147.84 | 2:10.00 | 68.23 | 0 | 68.23 | 2 | ..... | ..... | 999 | ..... | ..... | .. | .. | ..... | ..... | N. Y. C. | Oct. 4, '95 |
| Oct. 24, '95 | L. S. & M. S. | Chicago | Elkhart | 87.4 | 1:25:00 | 61.38 | .. | ..... | 3 | 304,500 | 488,500 | ..... | 17 A | 17×24 | 4 | 72 | 65,100 | 104,600 | Brooks | Nov. 1, '95 |
| " | " | Elkhart | Toledo | 133.4 | 2:14:35 | 64.24 | .. | ..... | .. | ..... | ..... | ..... | ..... | ..... | .. | .. | ..... | ..... | " | " |
| " | " | Toledo | Cleveland | 107.86 | 1:46:06 | 60.96 | .. | ..... | .. | ..... | ..... | ..... | ..... | ..... | .. | .. | ..... | ..... | " | " |
| " | " | Cleveland | Erie | 95.5 | 1:25:32 | 66.99 | .. | ..... | .. | ..... | ..... | ..... | ..... | ..... | .. | .. | ..... | ..... | " | " |
| " | " | Erie | Buffalo | 86 | 1:10:46 | 72.91 | .. | 75.11 | .. | ..... | ..... | ..... | ..... | ..... | .. | .. | ..... | ..... | " | " |
| " | " | ..... | Brockton | 1 | ..... | ..... | .. | 92.3 | .. | ..... | ..... | ..... | ..... | ..... | .. | .. | ..... | ..... | " | " |
| " | " | Chicago | Buffalo | 510.1 | 8:01:07 | 63.61 | .. | 65.07 | .. | ..... | ..... | ..... | ..... | ..... | .. | .. | ..... | ..... | ..... | ..... |
| Oct. 24, '95 | P. R. R. | J. City | Phila. | 89.6 | 1:33:21 | 57.6 | .. | ..... | 6 | 548,657 | 753,457 | 1,651 | Cl. L | 18½×26 | 4 | .... | 91 600 | 134,800 | P. R. R. | Jan. 17, '96 |
| " | " | Monmouth | ..... | 10.27 | 0:10:00 | 65.14 | 0 | 65.14 | .. | ..... | ..... | ..... | ..... | ..... | .. | .. | ..... | ..... | ..... | " |
| Nov. 10, '95 | C., B. & Q. | Neponset | Buda | 6 | 0:04:30 | 80 | 0 | 80 | 4 | ..... | ..... | 512 | Mogul | 19×24 | 6 | 68 | 101,000 | 120,000 | Rogers | Dec. 13, '95 |
| May 7, '96 | Mich. C. | Windsor | St. Thomas | 111.2 | 1:43:05 | 64.72 | .. | 67.32 | 3 | 230,050 | 434,500 | 441 | 10 W | " | 6 | 68 | 96,300 | 123,500 | Schenectady | ..... |
| " | " | St. Thomas | Ft. Erie | 118.2 | 1:47:15 | 66.13 | .. | 73.68 | 3 | " | " | 431 | " | " | 6 | 68 | " | " | " | ..... |
| " | " | Windham | Waterford | 6.6 | 0:04:48 | 82.5 | 0 | 82.5 | 3 | " | " | " | " | " | 6 | 68 | " | " | " | ..... |
| June 10, '96 | Atl. City | Camden | A. City | 55.5 | 0:48:00 | 69.4 | 0 | 69.4 | 6 | ..... | ..... | 1,026 | Atlantic | 13/22×26 | 4 | 84½ | 80,030 | 141,000 | Baldwin | June 19, '96 |
| June 12, '96 | L., C. & D. (Eng.) | London | Dover | 78 4 | 1:22 35 | 56.9 | 0 | 56 9 | .. | ..... | 336,000 | 16 | 8 W | 18×26 | 4 | 78 | ..... | ..... | L. C. & D. | ..... |
| " | N. (France) | Calais | Paris | 185.5 | 3:34.04 | 52 | .. | 56 5 | .. | ..... | 412,160 | ..... | 4c. comp. | ..... | 4 | 84 | ..... | ..... | ..... | ..... |
| June 20, '96 | Atl. City | Camden | A. City | 55.5 | 0:57.00 | 58.42 | 0 | 58.42 | 11 | 701,450 | 927,450 | 1,027 | Atlantic | 13/22×26 | 4 | 84½ | 78,600 | 141,000 | Baldwin | June 26, '96 |
| July 3, '96 | C., B. & Q. | Chicago | G'burg | 162.5 | 3:16:00 | 49.75 | 5 | 53.25 | 6 | 600,000 | 824,300 | 500 | Columbia | 19×26 | 4 | 84 | 86,200 | 138,000 | " | ..... |
| " | C., M. & St. P. | Forest Glen | Nat. Ave. | 74 0 | 1:22:00 | 54.2 | 1 | 57.7 | 13 | 974,390 | 1,200,030 | 839 | Columbia | 13/22×26 | 4 | .... | 71,600 | 140,700 | " | Jan. 22, '97 |
| Nov. 21, '96 | S. & R. | Weldon | Shops | 76 3 | 1:12:30 | 63.56 | 0 | 63.56 | 3 | ..... | ..... | 540 | 8 W | 19×24 | 4 | 63 | 75,000 | 118,500 | Richmond | ..... |
| Feb. 15, '97 | C., B. & Q. | Chicago | Denver | 1,025 | 18.53:00 | 54 27 | 35 | 60 | 1 | 72,000 | ..... | ..... | ..... | ..... | .. | .. | ..... | ..... | ..... | Feb. 26, '97 |

A Table of Fast and Unusual Runs—From the Work "Modern Locomotives," Soon to be Published.

## Mineral Production of the United States.

Mr. R. P. Rothwell, editor of the *Engineering and Mining Journal*, sends us an advance copy of the very complete and systematic table prepared by him of the mineral production of the United States in 1895-6 for Volume 5 of "The Mineral Industry," which volume will soon be published. The mineral and metal production of the United States in 1896 was the largest in the history of this or any other country, and it is believed that the economic details collected in the forthcoming volume show that the United States is rapidly reaching the point where it will be the greatest exporter of minerals and metals of all the commercial nations. The total value of the results of the mineral industry of the United States in 1896 was very nearly $752,000,000, as compared with $733,000,000 in 1895. In 1896 the United States was the largest gold producer and the largest silver producer in the world, and by far the largest producer of copper, furnishing over one-half of the world's supply. The pig-iron output was also larger than that of any other country. In coal the total was less than that of Great Britain, but it is gradually approaching the line of equality.

The gold production reached $58,660,727, being an increase of $11,830,527 over 1895, or 25 per cent. In pig iron there was a decrease of 823,181 tons, or 8.8 per cent., and there was a corresponding reduction in steel and finished iron and a fall in the average price. The increase in lead was 11.4 per cent. In silver there was a large increase, the total from our own ores having been 56,222,322 fine ounces, or 9,891,087 oz. more than in 1895. In addition to this our smelters and refiners obtained from foreign ores and bullion, chiefly from Mexico and British Columbia, 33,053,555 oz., making the total quantity of silver put into marketable form 89,275,877 oz.

The production of bauxite fell off from 18,800 tons in 1895 to 17,096 tons in 1896. The value per metric ton, however, rose from $2.90 to $3.93. We are not sufficiently informed to be able to draw any conclusions as to the meaning of these facts in the aluminum industry.

The total coal production was 187,373,477 short tons, the decrease from 1895 having been about 1 per cent. This decline was wholly in anthracite, there having been a gain of a little over one million tons in bituminous. In coke there was a decrease of 17 1 per cent.

### *MINERAL PRODUCTION OF THE UNITED STATES IN 1895-6.*

Compiled for The Mineral Industry, Vol. V.,

By Richard P. Rothwell, editor of the *Engineering and Mining Journal*.

| Number. | Products. | Customary Measures. | 1895. Quantity. Customary Measures. | 1895. Quantity. Metric Tons. | 1895. Value at Place of Production. Totals. | 1895. Value at Place of Production. Per M. Ton. | 1896. Quantity. Customary Measures. | 1896. Quantity. Metric Tons. | 1896. Value at Place of Production. Totals. | 1896. Value at Place of Production. Per M. Ton. |
|---|---|---|---|---|---|---|---|---|---|---|
| | NON-METALLIC. | | | | | | | | | |
| | Abrasives: | | | | | | | | | |
| 1 | Carborundum | Sh. T. | 113 | 102 | $67,800 | *j*$6.65 | 595 | 550 | $365,612 | *j*$6.65 |
| 2 | Corundum | Sh. T. | 385 | 349 | 53,900 | 154.44 | 250 | 227 | 35,000 | 153.75 |
| 3 | Emery | Sh. T. | 1,700 | 1,542 | 119,000 | 77.17 | 1,550 | 1,406 | 108,500 | 77.17 |
| 4 | Garnet | Sh. T. | 877 | 795 | 39,465 | 49.65 | 2,842 | 2,578 | 96,628 | 37.48 |
| 5 | Grindstones | Sh. T. | 36,389 | 33,004 | 290,378 | 8.79 | 31,301 | 28,396 | 294,338 | 10.36 |
| 6 | Millstones | ..... | ..... | ..... | 15,925 | ..... | ..... | ..... | 14,852 | ..... |
| 7 | Tripoli & inf. earth | Sh. T. | 1,783 | 1,617 | 26,049 | 16.00 | 2,425 | 2,199 | 31,928 | 14.56 |
| 8 | Whetstones | ..... | ..... | ..... | 93,303 | ..... | ..... | ..... | 105,201 | ..... |
| 9 | Alum | Sh. T. | 117,900 | 106,959 | 3,537,000 | 33.07 | 77,700 | 70,489 | 2,331,000 | 33.07 |
| 10 | Antimony ore | Sh. T. | 1,083 | 982 | 37,905 | 38.60 | 150 | 136 | 4,750 | 34.92 |
| | Asbestos and talc: | | | | | | | | | |
| 11 | Asbestos | Sh. T. | 664 | 602 | 11,837 | 19.66 | 716 | 650 | 12,670 | 19.49 |
| 12 | Soapstone | Sh. T. | 22,133 | 20,097 | 342,298 | 17.03 | 24,319 | 22,068 | 265,806 | 12.05 |
| 13 | Talc, fibrous | Sh. T. | 40,000 | 36,368 | 320,000 | 8.80 | 45,000 | 40,824 | 315,000 | 7.70 |
| 14 | Asphalt | Sh. T. | 25,525 | 23,156 | 170,500 | 7.36 | 20,500 | 19,926 | 66,900 | 3.36 |
| 15 | Asphaltic limestone | Sh. T. | 5,550 | 5,035 | 16,650 | 3.31 | 3,119 | 2,829 | 8,714 | 3.08 |
| 16 | Bitumin's sandstone | Sh. T. | 42,374 | 38,542 | 139,945 | 3.63 | 53,119 | 48,189 | 138,714 | 2.66 |
| 17 | Barytes | Sh. T. | 20,255 | 18,371 | 99,020 | 5.39 | 21,500 | 19,504 | 86,000 | 4.41 |
| 18 | Bauxite | L. T. | 18,800 | 19,100 | 56,400 | 2.90 | 17,096 | 17,369 | 68,384 | 3.93 |
| 19 | Borax | Lbs. | 13,506,356 | 6,126 | 742,850 | *j*.12 | 15,258,014 | 6,921 | 762,900 | *j*.11 |
| 20 | Bromine | Lbs. | 394,854 | 179 | 102,662 | *j*.57 | 550,285 | 249 | 143,074 | *j*.57 |
| 21 | Cement, nat. hydraul. | Bbls*a* | 7,694,053 | 1,047,006 | 4,597,285 | 4.39 | 7,454,611 | 1,014,423 | 4,353,377 | 4.29 |
| 22 | Cement, Portland | Bbls*b* | 749,059 | 135,879 | 1,430,089 | 10.52 | 1,032,654 | 187,365 | 1,710,151 | 9.12 |
| 23 | Clay, refractory | Sh. T. | 3,750,000 | 3,402,000 | 4,500,000 | 1.35 | 4,000,000 | 3,628,800 | 4,800,000 | 1.32 |
| 24 | Clay, china | Sh. T. | 30,910 | 28,035 | 258,431 | 9.22 | 29,418 | 26,688 | 217,551 | 8.15 |
| 25 | Clay, common | Sh. T. | ..... | ..... | *i*60,100,000 | ..... | ..... | ..... | *i*65,000,000 | ..... |
| 26 | Coal, anthracite | Sh. T. | 51,897,297 | 47,081,308 | 80,250,652 | 1.71 | 48,855,563 | 44,321,768 | 88,105,837 | 1.98 |
| 27 | Coal, bituminous (*h*) | Sh. T. | 137,328,600 | 124,584,506 | 123,897,958 | 1.00 | 138,463,254 | 125,613,864 | 115,827,813 | .93 |
| 28 | Coal, cannel | Sh. T. | 69,747 | 63,274 | 191,804 | 3.03 | 54,660 | 49,587 | 146,488 | 2.95 |
| 29 | Coke | Sh. T. | 12,493,464 | 11,333,996 | 19,018,276 | 1.68 | 10,357,000 | 9,395,809 | 17,267,401 | 1.84 |
| 30 | Cobalt oxide | Lbs. | 6,400 | *j*2,903 | 8,640 | *j*.30 | 12,825 | *j*5,817 | 16,672 | *j*.28 |
| 31 | Copperas | Sh. T. | 14,118 | 12,805 | 69,846 | 5.45 | 11,170 | 10,133 | 52,662 | 5.19 |
| 32 | Copper sulphate | Lbs. | 45,000,000 | 20,412 | 1,750,000 | 85.73 | 48,732,840 | 21,605 | 1,949,313 | 90.22 |
| 33 | Chrome ore | L. T. | 1,553 | 1,578 | 16,795 | 10.64 | 702 | 713 | 7,775 | 10.90 |
| 34 | Feldspar | L. T. | 22,195 | 22,550 | 104,082 | 4.67 | 22,199 | 22,554 | 112,829 | 5.00 |
| 35 | Fluorspar | Sh. T. | 4,000 | 3,628 | 24,000 | 6.61 | 4,000 | 3,628 | 24,000 | 6.61 |
| 36 | Gilsonite (*k*) | Sh. T. | 1,150 | 1,043 | 34,500 | 32.12 | 1,700 | 1,542 | 54,500 | 35.34 |
| 37 | Graphite, crystalline | Lbs. | 377,450 | 172 | 17,286 | *j*.50 | 405,006 | 184 | 18,225 | 9.90 |
| 38 | Graphite, amorphous | Sh. T. | 840 | 762 | 4,700 | 6.17 | 574 | 520 | 3,850 | 7.40 |
| 39 | Gypsum | Sh. T. | 298,572 | 270,864 | 974,219 | 3.59 | 231,649 | 210,152 | 739,799 | 3.52 |
| 40 | Iron ore | L. T. | 15,988,000 | 16,243,808 | 27,979,000 | 1.72 | 14,650,000 | 14,884,400 | 28,567,500 | 1.92 |
| 41 | Lime | Bbls*c* | *i*60,000,000 | 5,443,164 | 30,000,000 | ..... | *i*60,000,000 | 5,443,164 | 30,000,000 | ..... |
| 42 | Magnesite | Sh. T. | 2,200 | 1,995 | 14,700 | 7.39 | 2,067 | 1,875 | 13,435 | 7.16 |
| 43 | Manganese ore | L. T. | 170,509 | 173,331 | 328,107 | 1.84 | 162,526 | 165,126 | 339,083 | 2.05 |
| 44 | Mica, ground | Lbs. | 740,000 | 335 | 31,956 | 95.40 | 877,000 | 398 | 37,711 | 94.75 |
| 45 | Mica, sheet | Lbs. | 6,200 | 3 | 2,200 | *j*2.13 | 8,000 | 4 | 8,405 | *j*2.31 |
| 46 | Mineral wool | Sh. T. | 6,989 | 6,340 | 74,962 | 11.36 | 5,953 | 5,400 | 61,714 | 11.43 |
| 47 | Monazite | Lbs. | 1,900,000 | 862 | 114,000 | 132.40 | 17,500 | 8 | 875 | 109.37 |
| 48 | Natural gas | ..... | ..... | ..... | 12,000,000 | ..... | ..... | ..... | 10,000,000 | ..... |
| 49 | Paints, mineral | Sh. T. | 47,084 | 42,705 | 1,086,767 | 25.45 | 54,153 | 49,227 | 973,268 | 19.77 |
| 50 | Paints, vermilion | Sh. T. | 118 | 107 | 118,190 | 1105.00 | 96 | 87 | 94,677 | 1088.25 |
| 51 | Paints, white lead | Sh. T. | 92,939 | 84,314 | 8,768,656 | 104.00 | 95,068 | 86,246 | 7,802,267 | 90.46 |
| 52 | Paints, zinc oxide | Sh. T. | 22,690 | 20,498 | 1,588,300 | 77.43 | 16,799 | 15,240 | 1,259,925 | 82.67 |
| 53 | Petroleum (crude) | Bbls*d* | 52,961,943 | 7,215,806 | 47,624,913 | 6.60 | 61,396,394 | 8,364,631 | 56,963,137 | 6.81 |
| 54 | Phosphate rock | L. T. | 1,098,017 | 1,015,587 | 3,296,757 | 3.25 | 863,754 | 877,574 | 2,591,262 | 2.93 |
| 55 | Marls | L. T. | 217,700 | 221,183 | 587,790 | 2.67 | 155,000 | 157,480 | 418,500 | 2.65 |
| 56 | Precious stones | ..... | ..... | ..... | 250,000 | ..... | ..... | ..... | 200,000 | ..... |
| 57 | Pyrites | L. T. | 107,731 | 109,088 | 342,587 | 3.14 | 117,782 | 119,666 | 297,853 | 2.49 |
| 58 | Salt, evaporated | Bbls*e* | 12,091,265 | 1,535,591 | 5,643,383 | 3.61 | 11,156,270 | 1,416,846 | 4,828,179 | 3.41 |
| 59 | Salt, rock | Bbls*e* | 2,184,589 | 277,443 | 828,954 | 2.98 | 2,198,303 | 279,184 | 711,919 | 2.55 |
| 60 | Silica, sand & quartz | L. T. | 523,640 | 532,018 | 553,128 | 1.04 | 720,399 | 732,925 | 1,076,038 | 1.46 |
| 61 | Slate, roofing | Sq'es. | 752,606 | 238,576 | 2,494,213 | 10.45 | 699,100 | 221,615 | 2,260,862 | 10.25 |
| 62 | Slate, manufactures | ..... | ..... | ..... | 392,877 | ..... | ..... | ..... | 467,575 | ..... |
| 63 | Soda, natural | Sh. T. | 1,900 | 1,724 | 47,500 | 27.56 | 3,000 | 2,722 | 65,000 | 23.88 |
| 64 | Soda, manufactured | M. T. | ..... | 167,000 | 3,841,000 | 23.00 | ..... | 158,975 | 3,656,425 | 23.00 |
| 65 | Stone, limestone (flux) | L. T. | 4,723,154 | 4,798,724 | 1,889,262 | ..... | 4,311,563 | 4,380,548 | 1,724,625 | ..... |
| 66 | Stone, marble | Cu. ft | ..... | ..... | 2,888,114 | ..... | ..... | ..... | 2,600,429 | ..... |
| 67 | Stone, onyx | Cu. ft | 1,200 | 91 | 12,000 | 131.87 | 3,000 | 228 | 24,000 | 105.26 |
| 68 | Stone, oölitic | Cu. ft | 4,790,422 | 365,108 | 1,005,192 | 2.75 | 4,040,999 | 308,111 | 755,891 | 2.45 |
| 69 | Other building stones | ..... | ..... | ..... | 26,269,943 | ..... | ..... | ..... | 27,219,484 | ..... |
| 70 | Sulphur | L. T. | 1,650 | 1,676 | 41,250 | 24.60 | 2,800 | 2,845 | 64,200 | 22.56 |
| 71 | Est. prod. unspecified | ..... | ..... | ..... | 5,000,000 | ..... | ..... | ..... | 5,000,000 | ..... |
| | Total non-metals | ..... | ..... | ..... | 488,651,351 | ..... | ..... | ..... | 495,747,553 | ..... |
| | METALS. | | | | | | | | | |
| 72 | Aluminum | Lbs. | 900,000 | 408 | 495,000 | *j*.25 | 1,300,000 | 590 | 520,000 | *j*.18 |
| 73 | Antimony | Sh. T. | 466 | 422 | 70,332 | 166.42 | 613 | 556 | 85,700 | 154.32 |
| 74 | Copper (*m*) | Lbs. | 386,453,850 | 175,294 | 40,616,300 | 231.70 | 467,822,973 | 212,201 | 49,729,582 | 234.35 |
| 75 | Gold | Ozs. *f* | 2,265,612 | *j*70,478 | 46,830,200 | *j*664.60 | 2,837,965 | *j*88,272 | 58,660,637 | *j*664.60 |
| 76 | Iron, pig | L. T. | 9,446,308 | 9,597,449 | 108,632,542 | 10.77 | 8,623,127 | 8,761,120 | 91,577,610 | 10.45 |
| 77 | Lead, value at N. Y. | Sh. T. | 156,854 | 142,298 | 10,132,768 | 71.20 | 174,792 | 158,271 | 10,381,843 | 65.59 |
| 78 | Platinum | Ozs. *f* | 150 | *j*.4.66 | 2,250 | 482.83 | 200 | *j*.6.21 | 2,800 | 450.89 |
| 79 | Quicksilver | Flks*g* | 33,978 | 1,179 | 1,313,589 | 1114.00 | 33,180 | 1,151 | 1,227,660 | 1066.00 |
| 80 | Silver, comm'l value | Ozs. *f* | 46,331,235 | *j*1,441,087 | 30,254,296 | *j*20.99 | 56,222,322 | *j*1,748,710 | 37,725,178 | 21.57 |
| 81 | Zinc | Sh. T. | 81,858 | 74,245 | 5,942,890 | 80.04 | 77,637 | 70,432 | 6,074,219 | 86.24 |
| | Total metals | ..... | ..... | ..... | 244,290,167 | ..... | ..... | ..... | 255,985,229 | ..... |
| | Grand totals | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |

(*a*) Barrels of 300 lbs.; (*b*) 400 lbs.; (*c*) 200 lbs.; (*d*) 42 gals.; (*e*) 280 lbs. (*f*) Troy ounces. (*g*) Flasks of 76½ lbs. (*h*) Bituminous coal includes brown coal and lignite. The anthracite production is the total for Pennsylvania, Arkansas, and Colorado. (*i*) Estimated. (*j*) Kilograms or per kilogram. (*k*) Including bitumen from Texas. (*m*) The value of the copper production is calculated at 0 25c. per lb. less than the average price of Lake copper at New York.

Abbreviations: Sh. T., short tons (2000 lbs.); L. T., long tons (2240 lbs.); M. T., metric tons (2204.6 lbs.); Sq'es, squares (100 sq. ft., lapped and laid).

The production of crude petroleum reached 61,396,394 bbls., being 8,434,451 bbls., or 16 per cent. more than in 1895.

## Railroad Mechanical Engineering at the University of Minnesota.

The University of Minnesota has issued the 1897-98 announcement of its College of Engineering and the Mechanic Arts, from which we gather some notes of the work in railroad mechanical engineering under Prof. H. Wade Hibbard. During the sophomore year, the students in railroad mechanical engineering pursue the regular mechanical engineering course, including carpentry and foundry work in the first term of the year, and pattern and machine work and working drawings during the second term, while in the third term they have forge work and machine drawing. The junior year studies in railroad mechanical engineering are those regularly given in the mechanical engineering course also. In the first term of the year, mechanics, kinematics and graphics, machine construction, physics, and technical reading are taught. In the second term, the course includes mechanics, machine construction, materials of engineering, physics and industrial electricity, and in the third the students have mechanics, electrical laboratory work, machine design, electrical generators and tool construction.

A complete senior year is, however, arranged for students who wish to specialize in railroad mechanical engineering. The instruction for the first term of this special course consists of lectures on design and construction, designing and drawing of details, the theory of thermo-dynamics, electrical transmission, mechanical laboratory work, link and valve motion and journal club work. During the second term of the year, the lectures on design and construction are continued, designing and drawing of assembled parts and the application of thermo-dynamics are given, the mechanical laboratory and the journal club work are continued, and electrical railroads and electrical laboratory work are taken up, as is also thesis work. To the lectures on design and construction, journal club and thesis work, which are continued during the third term, boiler designing and drawing, lectures on operation and maintenance and locomotive road testing are added.

The earlier portion of the course in link and valve motion, upon the diagram, is taken in conjunction with the regular course in valve gear. The latter portion omits most of the designs for high speed stationary engines, and treats of the Stephenson and other link motions exhaustively, principally after the Auchincloss method. A full sized practical drawing-board model is made by each student.

The course in machine design, given in the junior year is supplemented by the designing and drawing of locomotive and car details in the senior year. Machine design is intended to teach the general principles involved, with special applications. Commercial considerations of cost and kind of material and its market shapes, ease of construction in the shop, transportation, use, interchangeability, and repairs, are never lost sight of.

The lectures on design and construction, given in the senior year, are preparatory to the designing and drawing assembled parts, and also of a locomotive boiler. In this work, special problems, different for each student, are taken up and carried through to completion; such methods, with proper modifications for purposes of instructions, being followed as have been found most successful in shop drafting-room management. Furthermore, the lectures, reading and recitation, on design and construction, with past and future development, also relate to parts not involving the boiler and use of steam; but including the carriage, as frame, spring, and equalizing arrangements, running gear, brakes on locomotive and cars, cab, tender, trucks on engine, tender and cars, both pressed steel, built up and combinations. They also relate relate to locomotive boilers and connected parts, and include types, proportions, grates, flues, smokebox arrangements and stacks, riveted joints, bracing and staying, lagging, and smoke prevention. Also to the locomotive engine, treating of the details, heat insulation, cylinder proportions for various types, weight on drivers and special service, crank effort diagrams with inertia of reciprocating parts, cylinder and receiver ratios for compound engines, and starting valves for compounds. The courses in machine design and thermo-dynamics are in preparation for these lectures.

The lectures on operation and maintenance treat of management in service, deductions from tests and performance sheets of single expansion and compound locomotives, both American and foreign, conditions for economy, train resistances and loads, crew systems, coal premiums, expert instruction, water and its purification, fuels, boiler testing, lubrication, wear limits and repairs, and the repair shop.

The work in the mechanical laboratory, which is preparatory to the course in locomotive road testing, comprises the calibration of dynamometers, steam gages, weirs, meters and other apparatus; testing the lubricating value of oils; calorimetry; tests of water motors, pumps, injectors and boilers, and indicator practice. In locomotive testing valuable experience was gained last year by road tests of two simple and three compound locomotives. These were complete tests of boiler and of engine, with dynamometer car, following the standard directions of the Master Mechanics' Association. Half the tests were made under usual working conditions, and half with a second locomotive and expert braking crew behind the dynamometer car so that the test locomotive ran at constant power and speed up and down all grades.

The Journal Club is conducted through the year for the reading and discussion of the current engineering literature, and the student is instructed in the making of a "card index" of the subjects and references.

Courses in machine design, experimental investigation and locomotive engineering and car design are available for graduates.

During the year numerous visits of inspection are made to the manufacturing plants of St. Paul and Minneapolis, and these have proved of value in supplementing the class-room work. Students are encouraged to work, under special arrangements, in railroad shops during the summer vacations. This has proved its value as preparatory to the special work of the senior year. In every way the methods of the department are intended to place the student thoroughly in touch with the best railroad work, keeping always in sight the limitations to strict theory which railroad experience

has found financially and practically to exist. Students have frequent reference to a personal collection of over 1,500 blue-prints and drawings, carefully catalogued from the leading railroads and locomotive builders of the country. As these date from 1867 to the present, they will illustrate the past progress in railroad and shop equipment.

The Northwest Railway Club is open for the attendance of students, while several are enrolled as members. Instruction upon the air-brake was given for 1897 in the special air-brake instruction car of the Great Northern Railway by Mr. M. E. McKee, Superintendent of Air-Brakes.

The library of the department contains a collection of historic and recent works, while there is also a number of complete files of the transactions of engineering societies and of the leading technical publications to be found in it.

### New Lock of the Hien Coupler.

The discussion at the 1896 M. C. B. Convention and a report this year develop the fact that a number of well-known couplers will come uncoupled by the lock rising while the train is in motion. The illustrations given herewith show clearly the latest Hien double automatic coupler which was designed to prevent such break in-twos by simple but effective means.

Fig. 1 shows the body of the Hien coupler with the knuckle and locking mechanism in heavier lines in perspective, the lifting pin being partly broken away.

Fig. 2 shows the details of the lock and lifting pin. Its operation can be understood when it is explained that the lock is the ordinary revolving lock of the Hien coupler, which is revolved by a projection on the lower end of the vertical lifting pin, shown shaded in Fig. 2. It will be seen that a projection on this lock strikes against and is held by a projection on the lifting pin in case the lock is revolved before the lifting pin is raised; in other words, an interlocking mechanism is provided. There are no additional parts to the ordinary Hien coupler and it still retains the feature of setting itself so as to again couple when the tail of the knuckle is moved out in uncoupling.

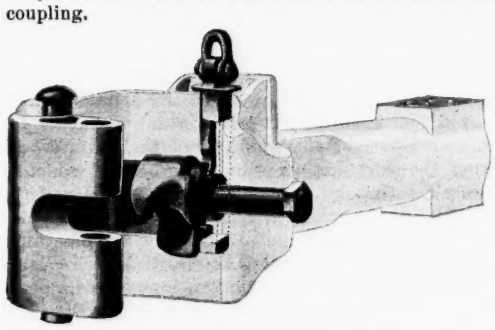


Fig. 1.—The Hien Coupler Lock.

This coupler is being made and sold by the Railroad Supply Company, Chicago, the material being made by the Whiteley Malleable Castings Company and the American Steel Castings Company.

### The Use of Cast Steel in Locomotive Building.*

A short time ago, about the only steel castings used in the construction of locomotives were the crossheads, which were quite expensive. The improvements made in the open-hearth process have been very great in the past few years. In fact, the basic steel foundry might well be termed the scavenger of the iron industry, and using all kinds of scrap the castings are produced at a low cost. It was after a visit to one of these foundries and noting the many improvements in use, that it occurred to me that money could be saved by making the frames for locomotives out of basic steel, and, in addition, get a stronger and more reliable job.

I took the matter up with the manager of a certain steel foundry, and he agreed to make the frames if I would furnish the pattern. We first tried a set for a heavy six-wheel switch engine, which we were building. The casting was made in two pieces and then welded in the center. When finished the frame cost 8 cents a pound, or, in other words, on the first attempt a saving of 2 cents a pound in first cost had been effected. The engine to which the frames were applied has now been in service for two years, doing the heaviest kind of work, pulling cars off boats on the Mississippi River Incline; the locomotive carries a steam pressure of 180 lbs., and is worked to its full capacity every day, and up to this time has received no repairs of consequence.

Since putting this engine in service, we have built five eight-wheel passenger engines and used steel frames at a cost of 7 cents a pound finished. These frames are cast in one piece. I also have made a new design of frame which I am getting up for a 10-wheel engine. This frame is to be cast with a "T" section in order to lighten and strengthen it. By this means a 6½-in. bearing for the shoes and wedges is obtained, something that is much desired, as the frame is the foundaton of the locomotive, and, as locomotives have been growing heavier and more powerful, we have been confined to very narrow bearings in wrought-iron construction. In fact, 50 years ago the pedestals of some locomotives then in use were as wide as the largest and most powerful engines of the present day. With the new engine I am using cast steel driving-boxes, putting brasses in them under a pressure of 40 tons, which is a sure cure for loose driving-box brasses. We would not attempt to fit brasses at this pressure in the common cast-iron box. With the steel boxes we babbit the face of the box next to the hub of the wheel, and also put in babbit strips on the shoe and wedge bearing. These boxes have been in use two years, and no trouble has been experienced with them.

Another place where cast steel can be used to good advantage is in the matter of driving wheel centers, giving the best results, as a lighter and stronger wheel can be made with cast steel than was ever obtained with cast iron, being 33 per cent. lighter. We have also been using cast steel for rocker arms and tumbling shafts with good results.

In my opinion, the use of cast steel in locomotive construction has come to stay, and the master mechanic who fails to make use of it will find in a few short years that he is behind the procession. What we most desire at the present time is to obtain material for constructing locomotives, having the greatest possible strength, which will at the same time allow all the reduction possible in the weight of the engine, thus allowing the use of heavier material in boiler construction; to a great extent, this will be obtained by the use of cast steel.

I will also add that I believe the time is near when locomotive cylinders will be made of basic steel, reducing the weight very materially at a great many points. We will not have to dispense with cast iron for wearing surfaces, as on the inside of the cylinder or the valve seat, because we can take a bushing of cast iron and pour the metal around it. While hot, the metal will weld to the bushing, and the valve seat can be handled in the same way. It will not cost any more to fit up a steel cylinder than it does at the present time with cast iron, and we will have a cylinder that will, in my opinion, be three times as strong as the present ones. We all know that in our very heavy locomotives we are troubled a great deal with the breaking of cylinders directly over the frame where the cylinders form the base for the boiler. The use of cast steel will also decrease the weight on the engine truck, another very desirable improvement to make at the present time on heavy locomotives, as some engines weight as much as 42,000 to 48,000 lbs. on the trucks. We can also make steam pipes out of malleable iron ⅜ in. thick, as against 1-in. now in cast iron. Thus, by reducing the weight of the cylinders and steam pipes, it will relieve our engines of considerable weight on the front trucks.

* From a paper by Mr. R. M. Galbraith, General Master Mechanic, St. Louis Southwestern Railway, before the Texas Railway Club.

### The David L. Barnes Library.

Mention has been made in these columns from time to time during the past few months of the bequest made by the late Mr. David L. Barnes to the Western Railway Club of his valuable technical library and files, but the formal transfer of the library to the club has only recently been completed.

At the April meeting of the club three trustees of the library were elected who, under the constitution, are to have charge of the management of the library and to be custodians of the library fund and the property of the library. Trustees are to be elected annually, the Chairman being also a member of the Board of Directors of the Club. Mr. William Forsyth, Mr. John W. Cloud and Mr. F. W. Sargent were elected the first trustees, and served until the end of the club year. At the annual meeting on May 18 these Trustees were re-elected except Mr. John W. Cloud, who, having been elected Treasurer of the club, was succeeded as Library Trustee by Mr. A. M. Waitt.

In accordance with a recommendation made by the Library Committee at the February meeting, and to enable the club to legally hold property, the incorporation of the club under the laws of Illinois was effected in April, and a meeting of the Board of Directors was held in Chicago on April 22 to consider the acceptance of the library, at which Messrs. A. M. Waitt, F. A. Delano, P. H. Peck, William Forsyth and G. M. Basford were present. At this meeting Mr. Delano presented a draft of the deed of gift from Mrs. Ida Irwin Barnes, widow of the late Mr. David L. Barnes, conveying to the corporation the library and files. Mr. Delano also offered the following resolution which was unanimously adopted:

"*Resolved*, That this corporation accept the gift tendered to it by Mrs. David L. Barnes, conveyed by the deed, a copy of which is attached to this resolution, upon the terms and conditions and for the purposes expressed in said deed."

As the Western Railway Club had no club headquarters, it was decided to accept the offer made by the *Railroad Gazette* to furnish a separate room for the library in the Western Offices at 1750 Monadnock Building, Chicago, where the library now is, and arrangements were made with Mrs. H. deK. Woods, of the *Railroad Gazette*, to act as librarian. In the April number of the Proceedings of the Club there appears a special notice announcing that the library is open for the use of members and their friends from 9 a. m. to 5.30 p. m. on week days, except on Saturday until 3 p. m.; that the books must not be removed from the library, and that letters from out-of-town members desiring information from the library will receive prompt attention.

As shown by the report of the Library Committee, presented at the February meeting, the library contains about 600 volumes, consisting of bound volumes of engineering and railroad periodicals and proceedings of technical societies, and a collection of books on railroad rolling stock, steam engines and boilers, electricity, strength of materials and other engineering subjects. These books were carefully selected by Mr. Barnes and arranged in substantial cases, and form a useful collection for those engaged in railroad engineering.

In addition to this collection of books there are 50 large scrap books, in which are filed such tracings, blue prints, results of tests, clippings from newspapers, etc., relating to current engineering and railroad work as are thought valuable for reference. These volumes are called "Engineering Files," and a complete card index to their contents is kept, in which each drawing, tracing or other item is indexed under two or more headings. In this way the information is easily accessible.

There are also 20 volumes of pamphlets, in which are filed papers and publications appearing in pamphlet form which are not of sufficient value to warrant the expense of permanent bindings, and are too thick to be put into the engineering files. These Mr. Barnes had bound in his own office, in heavy manilla covers, several pamphlets in each volume. On the backs of the volumes are typewritten the titles of all the pamphlets within. Each pamphlet is also indexed in the card catalogue under one or more headings.

This system of filing and indexing was adopted by Mr. Barnes after careful consideration of the requirements of his work, and of the various systems of filing in use elsewhere. It was described in detail in the *Railroad Gazette* of Jan 4, 1895, page 9.

In the library are also a large number of duplicate copies of the Proceedings of the Western Railway Club and of the other railroad clubs for several years back. We are informed that these duplicates will be sold to those desiring to complete their files, or exchanged for copies of back issues not now in the library.

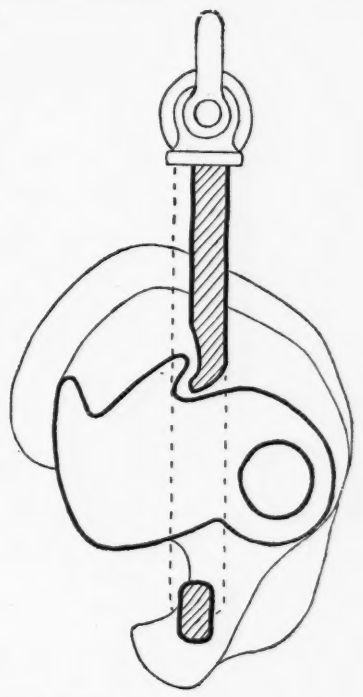


Fig. 2.—The Hien Coupler Lock.

There are also on file for reference about forty current technical periodicals and society proceedings, and it is the intention to increase this number as rapidly as possible.

At the February meeting of the Club it was decided to open a subscription for the library fund, in order to insure the proper care of the library until a more permanent financial plan could be matured. The request for contributions to this fund has met with generous response, and it is understood that the sum already in hand will provide for the care of the library and the necessary expense for binding for more than a year.

The Western Railway Club is to be congratulated upon having come into possession of so much useful information in a form which is available for all its members. To those who knew of Mr. Barnes' active interest in the club, of his willingness always to assist others desiring information, and of his generosity in giving his time and strength to all who needed his help, it will seem eminently fitting that through this bequest the Western Railway Club has now available for use a collection of technical literature and information pertaining to railroad work, particularly to the work of motive power and car departments, that is unequaled by that of any other railroad club in the country, and which is an excellent nucleus from which to build up a larger library.

It is to be hoped that the trustees will have, in their effort toward making the library of increasing usefulness, the support and co-operation of all the members of the club, who can, not only by donations of suitable books, periodicals and materials for the files, but also by their interest in the progress of the library, help to make it of lasting benefit and value and a worthy memorial of David L. Barnes.

RAILROAD GAZETTE

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## EDITORIAL ANNOUNCEMENTS.

**Contributions.**—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

**Advertisements.**—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

Mr. Cowen's explanation of the westbound freight rate situation, printed in our traffic column, is exceedingly lucid, as lawyers' utterances always are, but, to use the language of the street, he doesn't get any where. The Baltimore & Ohio will do various nice things *if* the other roads will be good. That has always been the position of every road in every such conference. It was a fine compliment to Mr. E. B. Thomas to declare him such a fair-minded man as to be fit to arbitrate a question in which he himself is interested, but it was hardly likely that the proposition would be accepted by the other roads. It was too revolutionary. We judge that Messrs. Cowen and Murray proposed to accept a certain percentage of the westbound competitive freight; but as it does not appear that Messrs. Depew and Thomson had authority to agree to any definite figure, the exceeding friendliness of the interview does not seem as yet to have any business value which can be expressed in figures, or even in words. Hitherto it has been supposed that the other roads were willing that the B. & O. should have 7.4 per cent. of the westbound freight; but it is reported that since the receivership it has been getting twice as much as that. Is the present demand, so promptly and cheerfully acceded to, for 14.8 per cent? If so, how is it going to be assured to the B. & O.? Mr. Cowen says that there has hitherto been no pretense of evening up the percentages. How can they be evened up now? If the B. & O. has secured its increased tonnage by cutting rates, the only practicable way to perpetuate the increase by above-board methods is for the other roads to grant a greater differential; but we do not hear that any such change has been announced. That rates have been cut, in some way, seems to be admitted, for all the other roads, except the Lackawanna, are charged with having cut them, and the B. & O. is claimed not to have acted differently from the rest.

This authoritative avowal that a state of demoralization has existed right along under an association which has been considered such a power for good, and which has, in fact, accomplished much actual good, will have a bad effect upon the public; that is, on Congressmen and editors. They will jump at the conclusion that railroad officers, in supporting the Joint Traffic Association, have been insincere, and in praising its principles have been trying to deceive the public; and such a result cannot be wondered at. And yet the explanation of the course of events leading to the present situation is, no doubt, quite simple. Probably the true facts will not be allowed to leak out for some time, if at all, but a very probable explanation is this: First, the strength of the Joint Traffic Association lay, largely, in the written agreement to make no changes in rates except by resolution of the Board of Directors; but the insolvency of the Baltimore & Ohio abrogated this bond, as far as that road was concerned, and the Receivers were bound by nothing, though they continued the representative of the road in the Association's Board of Managers. Second, the Receivers, being bound only by an unwritten agreement, could at once adopt the "*if*," which appears in Mr. Cowen's statement and which railroad officers always adopt when they intend to strictly keep the letter of an agreement, but to keep the spirit of it only so far as they please. *If* no other road did wrong, they would maintain rates. But (third) other roads were doing wrong. Every now and then some little irregularity was reported to the Board of Managers. One or more roads had arrangements with steamers for export grain, which arrangements in themselves were practical admissions that rates were manipulated.

These conditions being present, the rest of the descent was easy. *Any* deviation from rates, if it diverted business from the B. & O., would warrant that road in increasing the activity of its soliciting agents, would it not? And how could that be better done than by the payment to the agent of liberal commissions? And if such efforts failed on eastbound grain, why not try them on westbound merchandise? And if the B. & O. paid large commissions on freight in New York, why, the other roads would be compelled to do the same, would they not? And, large commissions being paid, and no questions asked, how long before a part of the agent's commission would be paid to the shipper? If one shipper gets this kind of a rebate all the large shippers soon get the same. The climax of the whole wretched business is illustrated in the statement, by a New York reporter, that a soliciting agent lately bought of a shipper a measly office dog, worth less than 50 cents, for the sum of $250. For an agent to divide his commission with a shipper is a virtual violation, by the company employing him, of a just provision of the Interstate Commerce law, and the managing officer who pays high commissions, knowing this, has to use a powerful opiate to benumb his conscience to the necessary degree; but he has the alternative of doing something of that kind or reporting to his directors that he knows not how to keep up the volume of freight that they demand of him. One of the conspicuous omissions of the Joint Traffic agreement is a clause forbidding the payment of commissions on any business, passenger or freight. This remedied, the task of producing permanent stability of rates would be much simplified, for if all agents were paid solely by salary the payment of secret rebates to shippers would be a much harder trick to work.

Senator Bill Chandler has done one good thing—he has called for a careful and exhaustive investigation of the Joint Traffic Association. He believes that it is essentially an eleven-billion-dollar trust and alleges that it operates in violation of law. As this association is the most useful joint railroad organization that has ever existed in this country, there could be no better instrumentality for promoting the spread of knowledge concerning the economics and the ethics of "the railroad problem" than a thorough exposition of just what it has done during the past year and a half. The Senate Committee should therefore comply with this request to get and publish the facts. True, the function of a congressional committee is usually to waste money and darken counsel; but if we could really have published a true view of the railroad situation, as exemplified in the work of this association, it would be a great public gain. The Board of Managers has acted constantly under criticism and yet it has done great things in maintaining stable rates. Much of the work of the Board has been that of a conference between members who represent antagonistic interests, rather than what is ordinarily called committee work or directors' work, so that each member was under the fire of criticism (from other members) at every step. The criticism of directors at home is also a powerful factor with each member. While friendly, it is rigid, and insistent on the best possible results from the work of the association. Criticism being thus powerful, the Board of Managers has been compelled to justify its every act; and while it has done the same kind of acts that traffic managers—singly and in conferences—have done thousands of times before, it has had to discuss and record the philosophy of those acts more fully than was ever before done; and a narrative of what a board of traffic managers has to do in the course of a year, with a full explanation of the reasons why it decides for or against each proposition, will constitute the best means of educating Congressmen that could be devised—provided they can be made to give attention to the lesson. The managers have not, we believe, raised a single rate above what it was before the association was formed; certainly none which was not extremely low, far below the normal level. The Populist cry that they would make advances if they could, has no significance, because the one fact that there are too many railroads for the business to be done, buries that issue out of sight. The important fact to be pounded into Chandler's head, and into the heads of all who believe his theories, is that howsoever much a railroad association may seem to resemble a "trust," it cannot effect any material advances in rates if it tries.

The English papers give reports of the Engineering Conference recently held in London by the Institution of Civil Engineers. One section of the conference was devoted to railroad engineering. This was opened by a brief paper from Mr. Harold Copperthwaite on "Rails and Permanent Way." One of his points was as to the weight of rails. He assumed that engineers will agree that a properly proportioned, double-headed rail, 65 to 70 lbs. per yard, on ties spaced 2 ft. 10 in. center to center is strong enough to carry any loads now running in the British Islands, and that any additional weight is intended to be worn off. But on fairly busy lines half a pound a yard a year is rather above than below the actual loss by abrasion, from which it follows that an 80-lb. rail will be worn down to 70 lbs. in 20 years, while it would take 40 years to wear down a 90-lb. rail to the same weight. He assumes further that molecular changes take place under traffic, from which the rail becomes unsafe, apart from its actual wear, and he concludes therefore that probably 20 years may be taken as the proper life of steel rails and that therefore it would be a waste of material to use a section heavier than 80 lbs. We do not discover in the report of the discussion that this point was considered by those who followed Mr. Copperthwaite, and very likely they felt that his points were hard to debate with any profit. In fact, his conclusion rests on several assumptions, the general application of which may be doubted. The loss in weight of half a pound a yard is too vague and general an assumption to stand as a safe point of departure. That loss would depend on many things, for example, the chemical make-up of the rail, the section, the work done in rolling, the heat at which it went last through, the rolls and the intensity of the traffic It is obvious at once that the latter point would be very important. Fast traffic would be much more destructive than slow traffic, the wheel weights being equal, and with a given tonnage at a given speed the destruction would be greater if the loads were heavy than if they were light. All of the facts enumerated above would enter to affect the wear of the rail, quite apart from any question of destruction by breaking or battering down the ends. Furthermore, the endurance of the rail would be much affected by its stiffness, and we all know that with a given weight the stiffness of the rail would depend very much on its section. Therefore, any effort to ascertain whether it would be economical to put down a rail of 70 lbs. or 80 lbs. or 90 lbs., to have any value whatever, must be based on the consideration of many different facts.

Sir Benjamin Baker spoke of the tendency in the United States to use higher carbon, saying that in some cases it had been carried as high as 70 points. Whether or not this is desirable is a matter for English engineers to face and work out. As bearing on this point Mr. Webb, of the London & North-Western, asked if anybody had tried chrome steel or nickel steel for rails. Sir Benjamin Baker had mentioned the fact that steel rails were liable to development of hair line cracks which might become dangerous and lead to fractures, and Mr. Webb thought that nickel steel would be free from this danger. Even if nicked and bent the crack would not extend as it would in ordinary steel. As the reader probably knows, the English have been very slow to go to high carbon, notwithstanding the facts that they get low phosphorus ores, roll on the average heavier sections than we do and have a climate such that the roadbed is less liable to irregularities due to freezing and thawing, and have in general much better ballasted tracks than we have. One would suppose that under such conditions they would be among the leaders in carrying the carbon contents high, but in our rail practice we are passing them, and the French have long used much higher carbon than either the American or the English rail makers. Indeed in France, carbon of 80 to 100 points does not seem to be very unusual.

Mr. Webb brought up the matter of joints. He said that 95 per cent. of the failures in rails on the London & North Western occur through the fish plate holes, although since "the magnificent stone

ballast had been placed on the London & North Western" the fish plate failures had been reduced 50 per cent. Mr. Webb showed a design for a joint that he had brought out, which is in the form of a chair to be placed on the tie. This is held together by two bolts going through below the rail and there is actually no bolt through the rail. There is one bolt at the middle to draw the two members of the chair together, but this goes through half round holes in the ends of the rail webs. We should consider this kind of joint as a step backward. Indeed Sir Douglas Fox warned engineers "against a fault that might be incurred by using too heavy rails and hardwood sleepers." He feared that the permanent way resulting would be too rigid, and the fault of early days when stone sleepers were tried would be reproduced. We would suggest that Mr. Webb's chair would be very likely to reproduce these early defects, but that stiff rails and hard sleepers would not; that is, if the rails were stiff enough. In fact, the old construction to which Sir Douglas refers was made up of light and flexible rails, supported on anvils, making many very rigid points with yielding lengths of rail between them. It would be hard to imagine anything worse in the way of construction. On the other hand, it seems quite reasonable that if the rail could be made stiff enough to avoid any undulations whatever between the ties we should get the best possible results. The wear on the rail, the wear of rolling stock, the wear of ties and the power required to haul the train would all be diminished.

### The Cast-Iron Car Wheel.

One of the most important reports to the Master Car Builders' Association this year is that of the Committee on Specifications and Guarantee for Cast-Iron Wheels. The committee makes two recommendations of quite unusual interest. One is to add a heat test to the specifications and the other is to modify the form of contract in such way that the buyer of cast-iron wheels may "buy mileage instead of wheels."

The heat test has been recently developed by the Pennsylvania Railroad through the experiments at Altoona, which we described last October. It is proposed to pour molten cast iron around the rim of the wheel, and if, two minutes after the pouring ceases, the wheel is broken in pieces, or any crack in the plate extends through the tread, the lot represented by this wheel will be rejected. When this test was first seriously proposed the opposition developed was considerable, and yet, singularly enough, it was apparently stronger among railroad men than among the wheel makers themselves. At least we heard from nearly all of the important car-wheel makers on the subject, and of these only two were unqualifiedly opposed to the tests. Generally speaking the position of the makers seemed to be tentative; they apparently wanted to wait and see and learn before expressing themselves definitely. A considerable number of them had tried such tests or proposed to try them, and we judged that on the whole the best makers would be rather pleased than otherwise to have such a test introduced.

The objections to this test have been: First, that it would raise the cost of the wheel; second, that ability of the wheel to resist the heat test was liable to be secured at the cost of wearing qualities, and third, that it is unnecessary, inasmuch as the object can be accomplished by a proper form of the wheel, and having settled on that form it is not worth while to run the risks of trying to get a metal especially adapted to stand the heat test. Another objection to the test is of the kind that is very often found in the Master Car Builders' Association among a certain number of small but obstinate minds, namely, that the whole thing began on the Pennsylvania Railroad. This, of course, is a powerful argument against it with a certain percentage of the Association, but it is hardly to be gravely considered among the technical objections; it is to be met rather by diplomacy than by argument.

The reason for the heat test, which governed the committee, as briefly stated, is that almost all cases of wheels broken in pieces are broken because of the heating of the rim by the brakeshoes, and this proposed heat test reproduces the conditions more perfectly than any other test that has been suggested. The committee does not state the evidence which has led it to believe that this test is not too severe and is not liable to cause the use of materials which will impair the durability of the wheel. This testimony will probably be drawn out in the discussion of the report.

It is hardly worth while to thrash over the arguments for and againt this test, inasmuch as so many of them are entirely theoretical. There are, however, certain facts that we may begin with, and the first is is that wheels are broken in great numbers because of heating under the application of the brakeshoes. The second is that the test proposed will ascertain pretty accurrately whether or not a given lot of wheels will stand this heating reasonably well.

Another fact which has been experimentally determined is that it is not only possible, but commercially practicable to make wheels that will stand the heat test. Last autumn we visited the Altoona shops, saw some of the tests and noted some facts, but have no official statement in writing, and therefore our report is liable to correction. As we noted the facts at the time they were that the Altoona tests at that time had reached something like two hundred; the wheels were taken at random from many different makes; in some cases all the wheels of one make were broken; in most cases more than 50 per cent of them were broken; of the Altoona wheels less than 10 per cent. were broken.

Of course no one will say that the proposed heat test will work out in practice according to the anticipations of the people who have suggested it. Perhaps it will and perhaps it will not; but all of this can only be determined by trial. Trial does not cost much and the chances are in favor of its success. Considering these facts and considering the ability and the information of the committee which has made the recommendation, presumably there is a fair chance of its being incorporated in the specifications.

A suggestion of still more importance is made in the proposed new form of wheel contract. This is so important because it proposes to entirely change the method of buying, and to make the contract of such nature that the burden of producing a good wheel will be thrown entirely on the maker. The proposition, in brief, is that the buyer shall pay a stipulated price for a wheel, which wheel shall be guaranteed to run a stipulated number of miles, the mileage made under freight cars to be a proportional part of the mileage made by wheels of the same lot run in passenger service.

We shall not stop now to go over the arguments which are briefly and clearly set forth in the committee's report and which will doubtless be expanded in the discussion of this very interesting and important proposition. It is enough to say now that this method of purchase would probably have an effect which the best wheel makers and many railroad men have long wished to see brought about. It would weed out the scamp makers. For eight or ten years we have heard the statement made over and over again that the price of cast-iron wheels was being hammered down until it had become impossible to make a good wheel at any price that could be got for it. If any plan can be brought about by which the railroad companies can pay for wheels according to the service that those wheels render, and by which this result can be reached without any question, the whole business will at once be put on a different footing. The man who knows how to make good wheels and who wishes to make good wheels and to get a fair price for them will then be able to put his product on the market. As matters stand now it is (at least wheel makers themselves say it is) very much a question of who can most successfully fool the buyer.

### Chilian Railroads.

We are indebted to Sr. Carlos C. Greene, Auditor of the Antofagasta & Bolivian Railways, for the twelfth annual report of the Director General of the State Railroads of Chile, for the year 1895, which has just been issued. There has been a very notable improvement within the past few years. In fact, had not a vigorous and progressive management been placed in control, with authority to renovate and reform, there would soon have been no railroad system to report upon. As a result of the comprehensive renewals of track, bridges, stations and rolling stock, the income has failed to equal the outgo, a result which has been intensified by alterations in the tariff schedule favoring the public more than the roads, by an increase in the cost of coal since 1886 from $7.65 per metric ton (2,200 lbs. nearly) to $18 in 1895, and latterly by throwing open to traffic certain new lines, which were really in an unfinished condition, but which were operated from motives of public policy. Hence we are prepared for the statement of the Director-General, that the loss in 1895 amounted to $455,255.56. The gross income was $13,080,-094.24; the gross expenses, $13,535,349.80. The sum of $1,112,881.71 was spent on new stations, while maintenance of way and buildings consumed $3,037,610.14. The heaviest single item is on locomotive account, running up to $5,208,637.79.

During the year 209,011 new sleepers were laid, of which 10,421 were cypress, the remainder being oak, of which latter 9,530 were creosoted. About the same number were replaced in the previous year, and renewals are still needed over considerable portions of the lines.

The number of locomotives has been increased from 215 to 234, of which total 132 were built in the United States. The passenger cars in service number 335, the Americans again leading with 206 of the total, the English, however, slightly exceeding us in first-class cars. But if we include eight Pullman cars, the United States is still ahead in all classes. The freight-car equipment shows a falling off from 4,030 in 1894 to 3,994 in 1895. Of those now in service 2,019 have eight wheels, and 1,975 are of the four-wheel type.

A great improvement in physical condition or discipline, or both, is suggested by the statistics of casualties. In 1894 the passengers and employees killed were 34 and in 1895 they were 14. The injured in the two years were 202 and 38. There may be an error in the statistics; or, dealing with so small a system, the figures of one year or the other may be vitiated by a few unusual occurrences. The passenger miles were 124 million and the proportion of casualties to travel in 1895 was much more favorable than in the United States, if the figures are correct. This is surely an extraordinary result after the period of railroad horrors when the Chilians felt that to travel on the government roads was next to committing suicide.

The Director-General strongly urges the immediate need of a system of compulsory insurance of employees, to provide for them if disabled, or to pay an indemnity to their heirs in case of death. Congress has approached this question with a kindly spirit, but owing to differences of opinion as to the ways and means of carrying it into effect the project has so far been delayed.

What with renewal of permanent way, improvement in rolling stock, and telegraph service, which has been thoroughly reorganized and rendered highly efficient, building of bridges, stations and warehouses, the Chilian railroads will apparently soon be in so good a condition as to plant, equipment and personnel, that the relative advantages or disadvantages of state ownership may have a test of some value as worked under a South American Republican government. The advocates of leasing the roads are many in Chile, and we have seen in Brazil a final determination, with a great sigh of relief, to turn over the state lines to the highest bidder.

### Annual Reports.

*Chicago, Rock Island & Pacific.*—The Rock Island reports to March 31, 1897. The total miles of railroad owned by the company are 2,880.7. The lines leased are 352.66 and the miles worked under trackage rights are 338.05, making the total miles worked 3,571.41. Of this mileage that in Kansas is the largest, namely, 1,124 miles. Iowa comes next with 1,069.

The results of operation are shown in the table below:

| *Earnings:* | 1897. | 1896. |
|---|---|---|
| Passenger | $4,072,126.64 | $4,445,952.85 |
| Freight | 11,229,175.33 | 11,159,100.26 |
| Mail | 562,512.28 | 540,259.86 |
| Express | 409,200.00 | 409,200.00 |
| Rents, interest, etc | 867,021.45 | 797,266.08 |
| Telegraph lines | 6,617.01 | 7,874.27 |
| Total gross | $17,146,652.71 | $17,359,653.32 |
| Operating expenses | 10,743,148.23 | 10,977,321.13 |
| Taxes | 869,679.02 | 889,272.92 |
| Net earnings | $5,533,825.46 | $5,493,059.27 |
| Percentage of expenses | 62 45/100 | 63 23/100 |
| Same, including taxes | 67 73/100 | 68 36/100 |

After paying interest to the amount of $3,321,525 and rentals and tolls to about $780,000, dividends of 2 per cent., amounting to $923,116, were declared, leaving a surplus of $520,480.

It will be observed that there was a falling off from 1896 in the passenger earnings, the decrease amounting to 8.41 per cent. The number of passengers carried fell off 7.95 per cent., and the passenger miles 12.72 per cent., but the rate was somewhat increased: that is, in 1897 it was 2.187 cents and the year before it was 2.089.

The freight earnings increased slightly, namely a little over $70,000, or 0.63 per cent. Revenue from through freight increased while that from local freight decreased. There was an increase in tons carried of 97,646, being 1.53 per cent. The ton-miles increased in still greater ratio, namely, 8.96 per cent., the total having amounted to 1,175,517,765. The rate per ton-mile, however, fell from 1.03 cents to 0.96. The average haul increased from 184 miles to 197, and the average freight train load increased from 143 tons to 158. In 1894 the load was 118 tons and in 1895 it was 121. This increase in average train load apparently accounts for the saving of $234,000 in operating expenses. The items of repairs to equipment and to track, bridges and buildings were actually somewhat greater in the aggregate than in 1896 or in 1895, $172,000 more than in 1896 and $368,000 more than in 1895. Other working expenses (including taxes) were $426,000 less than in 1896, $1,438,000 less than in 1895 and $2,665,000 less than in 1894. Of course the great saving was in the class of items that would usually be charged to conducting transportation. For example, we find that the cost of agents and stations was, in the last year, $516,000 less than in 1894; fuel for locomotives cost $467,000 less; freight train service was $218,000 less, and there was a saving also of $126,000 in outside agencies and advertising and a saving of $150,000 in payments for injuries to persons. The source of this last economy could not be traced without more knowledge than we have of the circumstances in the two years compared, and very possibly it is largely a matter of luck. The total of these five items amounts to a saving of $1,477,000 over 1894.

The Railroad Commissioners of Oregon have lately completed a six weeks' trip over the railroads of the state, making their semi-annual inspection, and we judge, from an account in the Portland *Oregonian*

either that these Commissioners are pretty plain-spoken men or the railroads are in pretty poor condition. The stereotyped phrases about everything being in excellent condition are not nearly so common as in most commissioners' reports. On the other hand the criticisms of deficient condition of roadway or lack of station facilities are made in temperate language, and the commissioners explicitly say that the railroads have done the best they could with the means at their command, the diminution of revenue having been in Oregon, as everywhere else, very serious. Referring to one line (and only one), the roadbed is spoken of as being in such bad shape that trains can safely be run only at low speed.

The Wabash road has leased trackage rights from Detroit (Windsor) to Buffalo, and after this week will run its through trains, with its own men, direct to the latter city from St. Louis, Kansas City and Chicago. The route is over the Grand Trunk (Southern Division) from Windsor, Ont., to Suspension Bridge, 229 miles, and the Erie from Suspension Bridge to Buffalo, 21 miles. There will be two through trains daily each way.

## NEW PUBLICATIONS.

*Block Signal Operation*, by W. L. Derr. New York: D. Van Nostrand Co. 250 pages, 4 in. × 6 in. Price, $1.50.

This work is called a "practical manual," and discusses in a straightforward way the main features of the theory and the work of block signaling, as looked at by an operating officer. Mr. Derr is Superintendent of the Delaware Division of the Erie road and writes from a superintendent's standpoint; that is, he makes prominent the discipline and the *general* management and maintenance, as distinguished from the mechanical features of signaling. He has little to say about the construction, inspection or maintenance of apparatus. He has not only had experience in signaling, but has been an assiduous student of details, so that he writes from actual knowledge, and for those branches of the subject outside his own immediate observation he has drawn from the best authorities. He has gathered fresh information concerning the management, on well-known, roads of all the prominent signals and mechanical devices for block signaling now in use in this country, including full transcripts of the rules issued by the railroads to their signalmen and trainmen. There are chapters on the usual methods of running trains, train dispatching, the time limit, etc.; definitions of block signaling terms, including two original definitions which are not particularly commendable ("non-meeting block and non-following block"); principles to be followed in locating signals, and in arranging block and interlocking signals as related to each other; the merits of various accessories; interlocking mechanism: train order signals; signal bells and their management, and the construction and equipment of signal cabins. In the chapter on Manual Blocking we have the rules of the London & North Western and of the Erie; in that on Controlled Manual Blocking, those of the New York Central, and on Automatic Blocking, those of the Lake Shore & Michigan Southern and the Illinois Central. Blocking by the train staff or tablet is called "machine blocking" and the author gives the rules of the London & North Western and of the Chicago, Milwaukee & St. Paul, which latter road has, however, only one block operated in this way. The book has an index filling seven pages.

*Derrah's Street Railway Guide for Eastern Massachusetts.* By Robert H. Derrah, 286 Washington street, Boston, Mass. Price, 10 cents.

This is a handy guide designed for travelers in Eastern Massachusetts, showing the different routes available for passengers, and contains full information in regard to fares and distances between stations in the vicinity of Boston. The names of all the street car lines are arranged so that the available routes between stations can be easily ascertained. A map showing the network of railroad as far north as the state line and as far south as Brockton accompanies the guide. It is interesting to note the number of steam roads that now find it necessary to compete with existing electric roads in their local traffic in Eastern Massachusetts. The thorough manner in which this guide is compiled should make it serviceable to many. It has received the unanimous indorsement of the Massachusetts Street Railway Association.

*Messrs. John Wiley & Sons*, New York, announce that they will issue shortly after July 1 a book by Colonel H. S. Haines, lately Commissioner of the Southern States Freight Association. Colonel Haines was until about two years ago Vice-President of the Plant System, and was for seven years President of the American Railway Association, and the book which is announced is a collection of his addresses delivered before that Association with an appendix containing other addresses.

## TRADE CATALOGUES.

*Open-Hearth Cast Steel.*—The Sargent Co., of Chicago, publishes a little advertising card showing results of tests of open-hearth cast steel. The elongation in 2 in. runs from 37 per cent. up to 42 per cent., the reduction of area from 50 per cent. to 53 per cent., and the tensile strength from 60,000 lbs. to 77,000 lbs. per square inch. In forwarding this card, or calendar, as it is called, the company says that its steel is considerably above the Government requirements. Furthermore, the company is anxious to show exactly the quality of steel to be had in its castings, thinking that the facts may have some effect on designs of machinery parts, as it is only recently that any steel casting company has been able to offer to its customers a guarantee of such qualities, and many users of steel castings still allow a larger factor of safety than is necessary.

*The American Motor Co.*, Havemeyer Building, New York, has issued a catalogue illustrating and describing the company's motors, operated by means of kerosene, gasoline, city gas or natural gas. A discussion of their adaptibility to horseless carriages and to boats as now in operation occupy some of the pages. Gas generators, which are furnished in combination with the motors showing how the cost of fuel is greatly reduced, are also referred to in a few concise words. A price list for different styles and types of motors is given on the last page.

*Summer Excursions via Fitchburg Railroad.*—The summer excursion book issued by General Passenger Agent Watson, of the Fitchburg, is, this year, entirely new; and while modest and compact is handsome, well arranged and evidently very full and carefully compiled. The first 60 pages, describing the towns, are profusely illustrated with new direct process cuts. The descriptive matter is exceedingly well written, and the hotel notes for each town are placed on the same page with the descriptive matter. This road will this year run through parlor cars from Boston to Burlington and Plattsburgh.

*Metal Structures for the Storage of Water.*—The Chicago Bridge & Iron Co., Rialto Building, Chicago, sends us a pamphlet illustrating and briefly describing elevated steel water tanks, stand pipes, tanks for grain storage and self-supporting steel smokestacks. The pamphlet also contains two or three pictures of bridge structures and one of a traveling crane for the North Chicago Street Railway.

*Wood-Working Machinery.*—The J. A. Fay & Egan Co. sends us a catalogue of wood-working machinery in the form of a poster. It is one sheet, about 25 × 40 in., containing engravings and very short descriptions of a great number of wood-working machines and tools made by that well-known house.

## London & Northwestern Loading Gage.

The accompanying drawing, Fig. 1, shows the style and manner of construction of the gage used on the London & Northwestern to test loads of freight to make sure that their size is within the limit necessary to pass safely through tunnels and other places where structures near the track necessitate close conformity to rigid limits. The gage consists essentially of an arched iron bar hung from a frame supported by a post fixed at the side of the track in a yard or other convenient place. The iron bar is ⅜ in. thick and 3 in. wide. It is hung loosely by chains from supports fixed

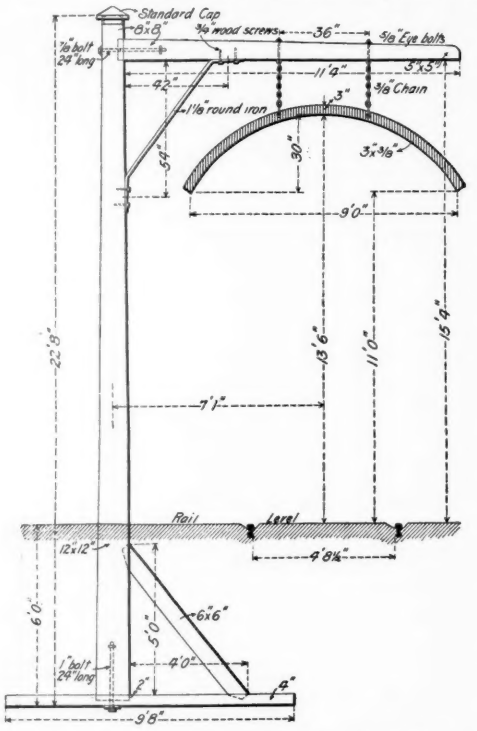


Fig. 1 — Loading Gage— London & North Western Railway.

3 ft. apart, and is thus freely movable, and cannot be damaged by coming in contact with a load. The distances from the track, the dimensions of the supporting structure and other particulars are sufficiently shown by the drawing.

Fig. 2 shows the standards of the London & Northwestern for loading and for the erection of platforms, buildings or other structures near the track. The minimum limit of distance from the rail for structures at stations is fixed at 8 ft., and the width of platform at 6 ft., as shown at *A*. At places other than stations the limit from the rail for structures is 4 ft. as shown at the bottom of Fig. 2, and from the side of the car it is 28 in., as shown at *B*. The door of a standard passenger carriage, when standing open at right angles to the side of the carriage, projects 26½ in. from the rail line. The standard height of station platforms is 36 in. above the top of the rail. A height of 30 in., shown by the lower dotted outline, is admissible in exceptional cases. The outlines appearing near the ends of the axles of the car indicate the position of car steps.

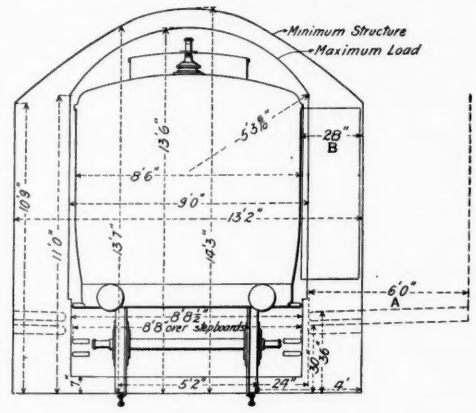


Fig. 2.—Standard Clearances—London & North Western Railway.

## M. C. B. Convention Exhibits.

The following exhibits were in place at the opening of the Master Car Builders' Association meeting at Old Point Comfort. This list is complete up to that time, but further exhibits are expected to arrive and these will be described next week:

Acme Machinery Co., Cleveland, O.—Double bolt cutter with Fergusson's automatic air turrets for operating by compressed air.

Adams & Westlake Co., Chicago, Ill.—Interior coach and vestibule trimmings of every description, lantern, engine, coach and switch and semaphore signal lamps and the Acme automatic car window curtain. The display included many patterns and designs, and was neatly arranged.

American Brake Co., St. Louis, Mo.—Model of a locomotive truck, showing the application of the latest form of engine truck brake.

American Steel Casting Co., Thurlow, Pa.—Cast steel locomotive frame showing how the material acts when bent cold; frame is welded at three different points. Cast steel driving wheel center for 84-in. diameter driver. Cast steel piston for 20-in. cylinder. Also cast steel locomotive eccentric and eccentric strap. Numerous test specimens are shown with the results of tests on cast steel.

American Steel Foundry Co., St. Louis, Mo.—Cast steel driving wheel broken and bent to show quality of the material. Cast steel bolsters and other steel castings of locomotive and car details.

Automatic Air & Steam Coupler Co., St. Louis, Mo.—This Company shows a new device by which the air brake, air signal and steam pipe couplings are made automatically.

The exhibit consists of a stationary passenger car end and coupler, and a movable freight car end and coupler, the latter mounted on a truck. It is operated by means of compressed air working on a piston to which the coupler is attached by means of a long piston rod.

The air and steam couplings are in one piece carried on a bracket riveted to the under side of *car* coupler.

Steam is piped from the boilers in the Hotel Cumberland and operates a 9½ in. Westinghouse air pump, which furnishes air for the air brake and signal pipes, and also for working the movable portion of the exhibit. The steam pipes on the cars are supplied from the pipe which furnishes steam for the air pump.

Brown & Sharpe Mfg. Co., Providence, R. I.—A No. 3 Universal milling machine in operation; power obtained from a 5 H. P. Crocker-Wheeler electric motor; also, milling and gear cutters, saws and various tools for making accurate measurements.

Boston Woven Hose & Rubber Co., Boston, Mass.—Specimens of steam and air brake hose, including the "Vim" hose.

Betlendorf Axle Co., Davenport, Ia.—Betlendorf pressed steel brake beam, both the finished beam and all parts separate. Samples of tubular rivet work.

Buckeye Malleable Iron Co., Columbus, O.—Two full size, Buckeye couplers, and Hoey's improved drawbar attachment, mounted on trucks to show operation.

Brown Automatic Car Coupler Co., Columbus, Ind.—Brown center draft couplers, mounted to show operation.

Boston Belting Co., Boston, Mass.—A complete line of air-brake, car-heating, gas, steam and water hose; rubber belting; "Imperial," plain and spiral and other piston-rod packing; "Phœnix Red" flange and joint packing; "Excelsior" self-vulcanizing packing; diaphragms for Eames vacuum brake; rubber locomotive blocks; rubber mallets and mats and car and and cylinder springs; solid rubber ball valves; mixed, fibrous and plumbago gaskets and rings; car step treads; brake, steam and gas tubing and a large variety of rubber mechanical goods. One of the attractive features of the exhibit is a picture of one of the largest rubber covered press rollers (for a paper making machine) ever made, being 24 in. in diameter, 150 in. face and weighing about 10,000 lbs.

Boston Artificial Leather Co., Boston, Mass.—Samples of Morocco ine, in various colors, a substitute for leather for car seats and general upholstering. A car seat, upholstered with Moroccoline, was also shown.

The E. T. Burrowes Co., Portland, Me.—A general line of curtain fixtures and material, including pinch handle and cable design car-window shades and the waterproof curtain-fabric "Oakette."

L. C. Chase & Co., Boston, Mass.—A large display of the celebrated mohair car plushes made by the Sanford Mills, of Sanford, Me. A new feature in this year's exhibit is a number of frieze plushes of latest designs.

Cloud Steel Truck Co., Chicago, Ill.—Two Cloud steel trucks applied to flat car of the Chicago, Lake Shore & Eastern Railroad. A new truck has been placed on top of the car for better inspection.

Chicago Grain Door Co., Chicago, Ill.—Models of rabbeted grain door and samples of the "Security" lock bracket for outside door.

Chicago Railway Equipment Co., Chicago, Ill.—Three full size National hollow brake beams and a number of roller side bearings, a description of which appeared in the *Railroad Gazette* last week.

Cook Cooler Co., Ltd., Flint, Mich.—Several Cook journal-box coolers and some specimens of broken axles due to hot bearings.

Crocker-Wheeler Electric Co., Ampere, N. J.—A 3-H. P. dynamo used to operate the tools of the Brown & Sharpe Co.

Crosby Steam Gage & Valve Co., Boston, Mass.—The Crosby chime whistle, which now has a balanced valve requiring no power to pull it; the Johnstone locomotive blow-off cock; the Crosby spring seat globe valve; cylinder and steam chest relief valves and the Crosby thermostatic water-back locomotive gage. Also other Crosby specialties, including a plain pop valve, locomotive muffler valve of '97, steam gage testing machine, and a steam engine indicator with Sargent's electrical attachment for taking simultaneous cards.

Chicago Pneumatic Tool Co., Chicago.—Piston air drill, pneumatic hammers, new pneumatic riveter, Manning sand paper machine and Boyer speed recorder driven by an air motor. The compressed air is supplied by a Rand duplex air compressor driven by a 10-H. P. Webster gasoline engine.

Critton Automatic Car Coupler Co., Kansas City, Mo.—Two models of freight cars equipped with the Critton automatic car coupler.

Composite Brake Shoe Co., Boston, Mass.—A number of specimens of partly worn brake shoes, with cork inserts, which have been in service on locomotives and tenders. Each shoe was labeled, showing the number of miles covered. One shoe was used in connection with a locomotive driving wheel for 101 days, covering 21,210 miles. A new passenger car brake shoe is also shown.

Curtis & Co. Mfg. Co., St. Louis, Mo.—Two automatic air compressors, one steam and the other belt driven.

Detrick & Harvey Machine Co., Baltimore, Md.—Double-head Adams bolt-threader, fitted especially for showing the threading of staybolts. Smith's bandsaw filing and setting machine and the Adam's bolt-threader head for use with other styles of threading machines. These tools are operated by a 5 H. P. Crocker-Wheeler electric motor.

Dressel Railway Lamp Works, New York City.—Marker and classification lamps; locomotive gage lamps and revolving deck caboose lamps.

O. M. Edwards, Syracuse, N. Y.—The Edwards self-lifting car window, as applied to a large number of passenger cars on the Pennsylvania Railroad.

Edwards Car Coupler Co., Troy, N. Y.—Edwards couplers mounted on carriage to show operation.

Edgar-Sebring Car Seal Lock Co., Colorado Springs, Col.—Portion of car door showing attachment of Edgar-Sebring seal, lock and automatic fastening on the back of the door.

Fairbanks, Morse & Co., Chicago, Ill.—The exhibit of the company inside the palm garden consists of a small model of the Sheffield section hand car and a larger one of a velocipede car wheel, together with models of and a full-sized Barrett lifting jack. Outside, on the grounds, the company shows a 3-H. P. gasoline engine operating a 7-in. × 10 in. pump. The engine is fitted with both electric spark igniter and igniting tube.

Forsyth Brothers & Co., Chicago, Ill.—Samples of car curtains fitted to show the Forsyth patent curtain fixture.

Gold Car Heating Co., New York.—Gold's duplex sealed jet steam heating apparatus, complete, with full-size piping for a passenger car, under steam, which is piped from the Hotel Chamberlain boilers. The exhibit includes Gold's hose couplers, traps and pressure regulators, all under steam pressure.

This company shows various styles of Gold's electric heaters for passenger coaches and electric street cars; these have three graduations of heat, at which points a current of 3½, 7 and 10 amperes is needed. There is also exhibited an electric heater in the form of a mantel, each mantel containing six heaters, each controlled by a separate switch; this is for use in offices and station buildings.

Gould Coupler Co., New York, N. Y.—Gould coupler and spring buffer.

Globe Car Coupler Co., Richmond, Va.—Two full-size couplers mounted on a carriage.

Goodwin Car Co., New York City.—Model, photographs and three full-size dump cars by which the method of loading and dumping was demonstrated. These cars were illustrated and described in the last issue of the *Railroad Gazette*.

Edward Harrington, Sons & Co., Philadelphia.—Welch coupler.

Wm. Hyde, Philadelphia, Pa.—Axle-box, with self-lifting attachment for raising boxes to remove brasses. Full size model of Hyde journal box-lid.

Gravity Car Coupling Co., Colorado Springs, Colo.—A number of models of the gravity automatic car coupler.

Interchangable Brake Beam Co., St. Louis, Mo.— Interchangeable brakebeams.

Invincible Car Coupler Co., Des Moines, Ia.—A model of the "Invincible" automatic M. C. B. coupler.

H. W. Johns Mfg. Co., 100 William street, New York City.—A complete line of asbestos roofing, roof coatings and cements, building felt, waterproof sheathing, cement felting, air-chamber coverings, sectional pipe coverings, fire felt, locomotive lagging, sponge felt, asbestos-sponge cement felting, asbestos rope packing, wick packing and sheet packing, vulcanized rope packing, asbestos and rubber cloth, tape and gaskets, asbestos cloths, fireproof rope, cords, twine, rugs, mats and screens, asbestos furnace and retort cement, plastic stove lining and concrete coating and vulcabeston insulation for steam pipes.

John R. Jones, Manayunk, Philadelphia, Pa.—Model in wood of a new steel car-wheel rolling machine.

Hancock Inspirator Co., Boston, Mass.—Full size and sectional (showing working) Hancock inspirators and ejectors, steam and check valves and locomotive hose strainer.

The M. E. Kanady Co., Cambridgeport, Mass.—Full-size car door showing the Standard car door hanger and K seal lock.

Keasby & Mattison Co., Ambler, Pa.—Magnesia lagging with large model of locomotive boiler showing method of attaching the lagging.

Knitted Mattress Co., Canton Junction, Mass.—Samples of knitted padding for car seats and backs.

Kinzer & Jones Mfg. Co., Pittsburgh, Pa.—The Kinzer composition filled brakeshoes to fit either the Kinzer spring connections or the M. C. B. standard brakeheads.

Henry L. Leach, North Cambridge, Mass.—Model and a full-size Leach pneumatic track-sanding apparatus for locomotives.

Marion Car Coupler Co, Marion, O.—Two full-size Murphy M. C. B. car couplers, mounted on trucks.

McCord & Co., Chicago, Ill.—The McCord journal box and lid.

Moran Flexible Steam Joint Co., Louisville, Ky.—Moran flexible joints under both steam and air pressure.

Monarch Brake Beam Co., Detroit, Mich.—Three Monarch brakebeams.

Michigan Malleable Iron Co., Detroit, Mich.—Detroit coupler.

A. Major, New York City.—Combined water cooler and filter.

P. H. Murphy Mfg. Co., East St. Louis, Ill.—Murphy's improved Winslow freight car roof.

National Malleable Castings Co., Cleveland, O.—The company had two exhibits, one in the palm garden and one outside on the grounds. A number of malleable iron castings for railroad use were shown, including the National car door fastener, National journal box (including one for 100,000 lbs. capacity cars) and journal box lid, center plates, Coffin car line, sill and brake block pockets, together with full-size Tower M. C. B. freight car and engine, pilot and tender couplers, and four malleable iron truck bolsters and one malleable iron body bolster. Models of these specialties in aluminum were also exhibited, together with one of the Eubank car door and a Tower coupler for passenger cars.

National Railway Specialty Co., Chicago, Ill.—Large model of one side of a freight car fitted with the Security car door.

A. O. Norton, Boston, Mass.—A number of Norton ball-bearing jacks for cars and locomotives.

National Car Coupler Co., Chicago.—National passenger and Miller combination coupler, National continuous platform buffer and double-acting equalizing yoke, National Freight Car Coupler No. 91 and Hinson drawbar attachment with steel follower plate.

New York Belting & Packing Co., 25 Park Place, New York City.—A large display of rubber goods including among other specialties a complete line of air-brake and steam hose, rubber tiling and bicycle tires.

New York Rail Insulation & Equipment Co., Newark, N. J.—Samples of rail fastenings and sound-deadening materials for use in track construction.

Pearson Jack Co., 156 Fifth avenue, New York City.—Samples of the Pearson jack for wrecking purposes.

Peerless Coupler Co., 26 Cortlandt street, New York City.—A full size and model of the Peerless M. C. B. car-coupler, and two couplers cut in sections to show working parts.

Pottier & Stymus Co., New York City.—Two passenger car seats of an improved pattern.

Peerless Rubber Co., 16 Warren street, New York City.—A well-displayed exhibit of rubber goods, including the famous "Rainbow" sheet packing, "Anaconda" corrugated engine and tender hose, air-brake, gas, steam and fire hose, spiral piston packing for Westinghouse air pumps, "Eclipse" sectional gaskets and the various styles of molded gaskets used by the Westinghouse Air Brake Co., car step treads, hard rubber valve discs, gage glass rings, pump valves and rubber matting and belting.

Q. & C. Co., Chicago, Ill.—Model and full-size McKee improved brake slack adjuster with all parts protected to make lubrication unnecessary, showing method of working, also a full-size Hoyt flush freight car door.

Rand Drill Co., 100 Broadway, New York City.—A duplex belt-driven air compressor, used to operate the various tools in the exhibit of the Chicago Pneumatic Tool Co.

Railway Supply Co., Chicago, Ill.—Two full-size Hien double automatic M. C. B. car couplers, with positive lock and the universal release rig. A journal box lift was also shown.

Railroad Signal Lamp & Lantern Co., New York City.—Complete line of signal-switch, semaphore, marker and classification lamps, made of heavy steel.

Charles B. Richey, Washington, D. C.—A model of an automatic railroad switch.

Revere Rubber Co., Boston, Mass.—Locomotive tender and air-brake hose, "Usudinian" and "Giant Red" sheet packing, U-shaped car heating hose, "Giant Red" valves and solid rubber valve balls, gaskets, car step treads, rubber thread and a biscuit of crude rubber. The exhibit was placed on a 4 ft. × 12 ft. interlocking tiling mat.

A. & P. Roberts Co. (Pencoyd Iron Works), Philadelphia, Pa.—This company has a fine exhibit of steel axles, bent and tested to show the quality of the metal. Freight axle, .35 per cent. carbon, is shown bent flat when cold; a passenger axle, .44 per cent. carbon, bent cold to about 30 degrees; M. C. B. standard 60,000 lbs. capacity axle, .40 per cent. carbon, which broke on the 33d blow under a 29-ft. drop. One P. R. R. passenger axle, .44 per cent. carbon, broke on the 19th blow under a 31-ft. drop, being turned after every other blow. One P. R. R. axle, No. 3, is shown in section, together with specimens of the same material tested for tensile strength and ductility. This axle was .44 per cent. carbon. Tests are shown where knots are tied in ¼-in. round specimens when cold.

Sams Automatic Car Coupler Co., Denver, Colo.—Models of the Sams automatic link and pin car coupler.

Sinclair-Scott Co., Baltimore, Md.—A full-size model of Monroe's "Royal Flush" car door.

Smillie Coupler and Mfg. Co., Newark, N. J.—Full-size Smillie M. C. B. car coupler.

Shelby Steel Tube Co., Shelby, O.—Samples of steel tubes and boiler flues.

Simplex Railway Appliance Co., Chicago.—Two metal bolsters.

Sterlingworth Railway Supply Co., New York City.—Several Sterlingworth-Morden brakebeams and a new beam just placed on the market.

Shickle, Harrison & Howard, St. Louis, Mo.—The S. H. & H. cast steel coupler. Application of tender coupler to front end of locomotive is shown by a model. This coupler turns up when not in use. Model of new cast steel "Ajax" truck. Model of metal truck designed and patented by Mr. John Player, of the Atchison, Topeka & Santa Fe. Three other models of trucks where various styles of this company's cast steel bolsters are used.

Star Brass Mfg. Co., Boston, Mass.—Steam gages and pop valves.

Standard Paint Co., New York City.—Samples of the well-known P. & B. Ruberoid car roofing and P. & B. insulating and sheathing paper; also electric insulating tape.

Thornburgh Coupler Attachments Co., Detroit, Mich.—Thornburgh attachments for couplers, mounted on timbers.

B. E. Tilden Co, Chicago.—Two locomotive and car replacing frogs with new clamp arrangement for attaching the replacer to the rail.

Toledo Railway Appliance Co., Toledo, O.—A number of samples of the gravity air-brake dust guard.

Trojan Coupler Co., Troy, N. Y.—Two full-size Trojan M. C. B. car couplers. The McKeen carry-irons for both freight and passenger cars are also shown in connection with the couplers.

Watson & Stillman, New York City.—One-hundred-ton crank pin press, 90-lb. rail web punch, spike slot punch, street girder and T-rail benders, 6 types of small jacks and two 100-ton jacks.

Webster Manufacturing Co., Chicago, Ill.—A Webster gasoline engine, used to operate the Rand compressor in connection with the exhibit of the Chicago Pneumatic Tool Co.

Western Railway Equipment Co., Chicago, Ill.—A full-size model of the St. Louis single-track flush freight car door, combination lug and follower, safety truck end castings, and Houston's pneumatic locomotive track sander.

Clarence Whitman & Co., 39-41 Leonard street, New York City.—Samples of Pantasote, a substitute for leather for car curtains, seats and head linings. A car seat upholstered with Pantasote is shown.

Williams & Moore Railway Jack Co., Chicago, Ill.—A 15-ton automatic lowering jack and an automatic lowering and trip jack of the same capacity; also a spike supporting tie plate.

William Verdon, Fort Plain, N. Y.—Samples of air-brake, steam and water hose bands.

## TECHNICAL.

### Manufacturing and Business.

The Hancock Inspirator Co., Boston, Mass., has purchased the entire business, including patents, of the Park Injector Co., of Boston and Whitman, Mass.

The Berlin Iron Bridge Co., of East Berlin, Conn., has received a contract to furnish and erect the steel framework for a new electric light plant to be built at Flushing, L. I., for the Queen Construction Co. The building will be fireproof and the roof of the engine and dynamo room will be lined with the Berlin Iron Bridge Co.'s anti-condensation roof lining, to prevent condensation of moisture on the under side.

The McKenna Steel Co., Jonesboro, Ill., is making rapid progress in building its rail renewing plant. It is reported that large quantities of old rails have been stored at the plant to be worked over as soon as it has been completed.

Bids were opened at the Washington Navy Yard on June 7 for a tank to be used for testing models of naval vessels. The lowest bid received was $50,000, from the Pennsylvania Iron Co., of Beaver Falls, Pa.

The Whiting Foundry Equipment Co., of Harvey, Ill., is shipping a number of 8 ft. turntables to the Mexican Central for use in warehouses.

The St. Joseph (Mo.) Bar & Axle Co. proposes starting up its plant shortly. A new engine, boilers and other machinery have recently been purchased. The mill will be started on merchant bar, mine rails, railroad supplies, spikes, etc.

The plant of the Union Switch and Signal Co., at Swissvale, Pa., which was recently closed for an indefinite period, has again been started up in full.

A contract for the buildings of the Landis Tool Co., at Waynesboro, Pa., has been given to the Shiffler Bridge Co., of Pittsburgh. The buildings will include a machine shop 80×80 ft. two stories high, with an iron roof, and a foundry 60×60 ft.

The universal mill of the Pottstown Iron Co., the valley mill of the Glasgow Iron Co., and the Glendale rolling mill, all of Pottstown, Pa., will be placed in operation during the present week.

The Berlin Iron Bridge Co., of East Berlin, Conn., is building a new steel roof for the power station of the Scranton Illuminating Heat & Power Co., of Scranton, Pa. The building is 42 × 195 ft., divided into two portions, a boiler-room and an engine-room.

The Chicago Railway Equipment Co. announces that it has entered suits for infringement of patents in the United States Circuit Court at St. Louis against the Interchangeable Brakebeam Co., and in the United States Circuit Court at Springfield, Ill., against the Missouri Malleable Iron Co., two suits in each case. These suits are to defend the patents on the National hollow brake-beam, and the Chicago Railway Equipment Co. says that it is the intention to prosecute them to a conclusion as soon as possible.

### Iron and Steel.

The Birmingham (Ala.) Rolling Mill Co. proposes building a steel plant to include an open-hearth furnace of 40 tons capacity. This furnace will be built in the vicinity of Alice furnace, owned by the Tennessee Coal, Iron & Railroad Co., which has produced basic iron during the past year.

The plant of the Diamond Steel Co., at North Reading, Pa., has been leased to the Reading Steel Co., which expects to put it in operation within a short time.

The rolling mill at Greenville, Pa., leased to the Atlantic Iron & Steel Co., was started by the receivers last week with 400 men employed.

The Mahoning Valley Iron & Manufacturers' Association at its annual meeting elected the following officers: President, J. G. Butler, Jr.; Vice-President, Myron Wick; Treasurer, W. E. Taylor; Secretary, James H. Nutt, all of Youngstown O.

No. 2 furnace of the Pennsylvania Steel Co., at Steelton, Pa., has been blown in. This furnace has been idle for more than a year, during which time a number of improvements have been made. The furnace is the largest at Steelton, having a daily capacity of over 200 tons.

The 10-in. rolling mill of the East Lebanon Iron Co., at Lebanon, Pa., was destroyed by fire on May 30. The loss was about $20,000, fully covered by insurance.

### New Stations and Shops.

The Gulf, Colorado & Santa Fe is preparing to remove its shops at Gainesville and Temple, Tex., to Cleburne, Tex. The shops at these three places are used principally for light repairs, those at Galveston being used for heavy repairs. Arrangements have been completed with the citizens of Cleburne for this change, but the date of removal has not yet been decided upon.

The contracts for grading and excavating for the foundations of the new coach and car shops of the Missouri, Kansas & Texas at Sedalia, Mo., have been awarded to George T. Menefee & Co., of Sedalia, Mo.

Work was begun on the new passenger depot of the Atchison, Topeka & Santa Fe at Hutchinson, Kan., on June 3. The new building will be of pressed brick with brown sandstone trimmings. It will be two stories high and will measure 125 × 56 ft.

### Taking Down the Old Suspension Bridge at Niagara.

The new 550-ft. steel arch at Niagara being so far completed as to carry the traffic, the old suspension bridge, which it replaces, is now being removed. This is done by letting the old steel stiffening trusses down on the lower floor of the new bridge, where they can be taken apart and carried away. The suspenders are then unfastened and taken down, the main cables being finally uncovered, taken apart and removed. The old bridge, instead of being taken down for rebuilding in another place, as it was thought it might be, has been sold to the Pennsylvania Steel Co., the contractor for the new arch, for scrap. As the strands of the cables are cut in the act of removing them, they coil up after the usual manner in which wire is shipped from the mills. This behavior on the part of the wires was to be expected from what was seen as far back as 1880, when Mr. L. L. Buck renewed the anchorages of the old bridge. At that time, specimens of wire taken from the cable, would coil up the same way when left free to themselves. The old cables were made of iron wire, and they have been found in good condition.

### The Bridgeport Grade-Crossing Improvement.

The New York, New Haven & Hartford is reported to be preparing to begin work on the elevation of its main tracks through the city of Bridgeport, the recent decision of the Connecticut Supreme Court having swept away all obstacles to carrying out the contract between the railroad company and the city. This improvement involves the widening of the roadbed for several miles, the elevation of the track for the purpose of abolishing a large number of grade crossings of streets, and the construction of a new drawbridge.

### Steam Tramways in Italy.

Italy has about one-fifth of all the steam tramways on the continent of Europe, although its population is only about one-twelfth of that of all Europe. At the end of June, 1896, the length of these tramways amounted to 2,850 km., besides 1,270 km. of narrow-gage railroad. At that time the total length of the Italian steam railroads was 14,160 km. Much the greatest part of these steam tramways is found in the north, principally in Piedmont and Lombardy. Only 294 km. are worked in the central and southern part of the peninsula and 80 km. in Sardinia. The greatest development of the system is in the valley of the Po, where it has followed the very complete system of highways. It is estimated that the steam tramways have

cost in total about 130 million francs, to which may be added 150 million francs as the cost of the narrow-gage railroads proper. A quite complete description of these steam tramways was published in the *Railroad Gazette* of May 10, 1895, page 293.

**Vulcanized Wood.**

The New York Wood Vulcanizing Co., 11 Broadway, New York City, received, as the reader probably knows, the contract to vulcanize twelve million feet of yellow-pine timber for the Northwestern Elevated road of Chicago. About one-half has already been treated. The wood was brought from Sabine Pass, Tex., to New York, treated, and shipped to Chicago at a total cost of $20 a thousand feet, or about 25 per cent. more than in its natural state. Mr. J. A. L. Waddell, Consulting Engineer for the road, estimated that with the life of the tie ten or 15 years, which is considered low, about 25 per cent. would ultimately be saved. The same company has recently shipped to a number of South American countries large quantities of timber vulcanized by the same process. A number of vulcanized ties were furnished to the Cartagena-Magdalena Railroad, and after seven and a half years of service were in good preservation. We are informed that the average life of native wood ties in that country is two and a half years, red ants adding to the destruction. The New York Wood Vulcanizing Co. has arranged to remove its plant from New York City to Perth Amboy, N. J., where it will have increased transportation facilities.' The capacity of the plant will be doubled to vulcanize 150,000 ft. of lumber a day.

**A Large Car Float.**

At the Crescent shipyard, Elizabeth, N. J., there is now building a steel car float for the New York, Philadelphia & Norfolk, which is 340 ft. long, 45 ft. wide and 12 ft. 6 in. deep. It is to run between Cape Charles, Va., and Norfolk. It will draw 6 ft. 3 in. of water when loaded and 3 ft. 3 in. when light. It will have four tracks with capacity for 28 freight cars. The only structure above the deck will be a deckhouse containing a steering-room and quarters for a crew of six, supported by four steel standards 17 ft. above the deck. The hold is divided into 18 water-tight transverse compartments, with a 6-in. flooding and drain pipe running into all of them. A small boiler generates steam for two steering engines, which are operated from the deckhouse. There are steam pumps to trim the craft by water. The boat is built of steel plates ⅝ in. thick.

**Oil Burning on the Southern Pacific.**

Various papers have said that the Southern Pacific oil burners are all to be converted to burn coal, owing to the rise in price of oil. Mr. Kruttschnitt, General Manager, has given us the facts in the case. "We had in use, running out of Los Angeles, six or eight locomotives burning oil fuel very successfully and effecting considerable economy thereby. There are several sources of fuel oil in addition to the local oil well in Los Angeles. A rapid rise in the price of the Los Angeles oil cut our supply short, and instructions were issued to the motive power department to take a sufficient number of oil burners out of service to keep pace with the reduced supply Our oil burners are so arranged that they can be very quickly and cheaply changed from coal to oil, or vice versa."

**The Horseless Carriage in Paris.**

An annual report made by the General Carriage Co., of Paris, which has a great capital invested in public cabs and carriages, contains a declaration of the policy of the company in the matter of the use of horseless carriages, from which it appears that it is seriously and actively at work to replace with automatic carriages all, or at least the greater part, of its horses. Within a year a sweeping reduction has been made in the inventory of its property, cutting down the valuation of carriages, horses and harness to a minimum point in the preparation for liquidating that part of its investment. The company is seriously studying electric and petroleum motors with a decided leaning toward electric motors. It has in preparation among various inventors and manufacturers a number of carriages of both types. The company is now in such a position as to its finances and its general business that it is probably better prepared to make this radical change than any other company that is or could be organized, and a high officer predicts that the change will be made within a year. After the first of next July, 500 horseless carriages with four seats, of different types, will be in public service at a probable price of one franc for the course, and it is stated further that "the type which is found to be the most practical after a trial of 15 days will be adopted for all the other carriages of the company." The company expects to train its present drivers to the management of these "automobiles," as they are called.

## THE SCRAP HEAP.

**Notes.**

The Illinois Central, after many weeks of suspension has resumed traffic on nearly or quite all its lines in Mississippi which were submerged by the floods.

The Baltimore & Ohio has recently discovered among the collections of its conductors a considerable number of counterfeit mileage coupons, the counterfeiters having attached them to genuine mileage book covers.

The New York Chamber of Commerce and the Philadelphia Commercial Exchange have adopted resolutions favoring the passage of federal laws permitting pooling by railroads, under the supervision of the Interstate Commerce Commission and subject to the veto power of the Commission if anything unreasonable is attempted,

Chicago press dispatches report that freight traffic is somewhat better on the lines west of that city. No very definite facts are given to substantiate this statement, but it is reported from Burlington, Ia., and from Lincoln, Neb., that the working time in the shops of the Chicago, Burlington & Quincy has been materially increased.

**The Steel Tow Barge Amazon.**

The steel tow barge Amazon, built by the Chicago Shipbuilding Co. for Mr. John Corrigan, of Cleveland, was launched at South Chicago on June 5. Although the Amazon is the largest tow barge on the lakes, being 385 ft. long, 48 ft. beam and 28 ft. deep, the work of construction was completed in a very short time, only a little over a month having passed since the keel was laid. The boiler and the auxiliary engine are in the stern, and the pilot-house amidships, while in the bow is a high forecastle. The barge is supplied with a steam towing machine and a steel towline, steam heat and electric light, and the steering gear, windlass, capstans and pumps are operated by steam. In the bottom is a large water ballast compartment. It is stated that the Amazon is already chartered for a cargo of 225,000 bush. of corn, which will weigh 6,300 tons.

**Permanent Injunction on the Kingsbridge Extension.**

The Court of Appeals on June 8 decided six questions of great importance, practically making void the King's Bridge extension of the Third Avenue Railroad, upon which it claims to have spent $2,000,000. The Court decides that an attempt to build a railroad upon a public highway without authority is a nuisance, and that the city of New York has no inherent right, independent of legislative permission, to grant a franchise for constructing and maintaining a railroad in the public streets, and therefore no sale of a franchise can be valid unless it was proceeded with in the manner prescribed by the Legislature The leading objection to the legality of the consent to the granting of the franchise given by the city under the state railroad act is that more than one extension of lines already existing was included in the resolution, and notice of sale, and that the city has no power under the statute to sell more than one at a time. The points in detail are as follows: (1.) The Common Council of New York City cannot make a valid sale of more than one extension of an existing railroad at the same sale to be struck off upon one bid when the extensions are separated from each other in such a way that they can only be operated together over the lines of an existing road. (2.) A sale made in this way vested no right in the Third Avenue Railroad to build any of the extensions above 162d street, on the King's Bridge Road. (3.) The Common Council has no power to impose as a condition of consent to the sale of an extension that the railroad shall pay into the City Treasury a sum of money in cash within a certain time, in addition to the percentage of gross receipts bid by it upon such sale. (4.) The sale of the franchise to the Third Avenue Railroad was void, and vests no right to build such extensions. (5.) The condition in the Common Council resolution that not more than five cents shall be charged for a continuous ride on the Third Avenue line only to or from the extension is valid. (6.) But if the Common Council did not make such a distinction for fares on extended lines, the grant would even then be invalid. In addition to its decision that the road's grant is void as relates to the extension, the court grants a permanent injunction against the road, restraining it from passing the property of Dorothy Clinst and Catherine Beekman, which in itself is a prohibition against completion.

**Another Ferryboat for the Pennsylvania.**

Traffic on the new Twenty-Third street ferry of the Pennsylvania Railroad has increased to such an extent that the company has given an order to the William Cramp & Sons Ship and Engine Building Co., to build another boat of the same pattern as the St. Louis and the Pittsburgh.

**A Link-Belt Decision.**

On June 1 the United States Circuit Court of Appeals, on an appeal from the Circuit Court for the Eastern District of Pennsylvania, handed down its decision in the case of the Ewart Manufacturing Co., whose general agents are the Link-Belt Engineering Co., of Philadelphia, against James H. Mitchell, to enjoin the alleged infringement of the claims of a patent issued Sept. 12, 1882, to James M. Dodge, for an improvement in chain cables, generally known as the "Dodge chain." That Court was of the opinion Mitchell's device did so infringe and decreed an injunction. The respondent appealed from this decree, and the case went before the Court of Appeals for review. In its decision the latter Court held that "In our judgment the device shown by Dodge's patent was novel in character, disclosed an invention of very decided merit and was a substantial advance over mechanical constructions, theretofore used in the art to which it appertained, and the claims of the patent should have such a construction as will give the patentee the full benefit of the advance which he has contributed to the mechanical arts, and claimed. . . . While the respondent's device is different in appearance, of seemingly different construction, and manufactured in a different way, yet when we go beneath these surface variations and measure it by the test of functional purpose and operation we find it is in substance, purpose and operation the same mechanism. . . . While the appellant has avoided a mere servile copy of form he has appropriated the substance of the Dodge invention. That in doing so he has rendered inoperative the function on one groove will not suffice to relieve him from the charge of infringement. Every element of the first claim is found in his structure. He uses the elements of the second, modified in form to suit the peculiar conformation of his rectangular links, but identical in functional effects, to secure the pintle-like bearings, and those of the third to gain the non-tortional relation between the links. He gets the same result which Dodge first showed by substantially the same means and in substantially the same way. We are of opinion the Court below reached a just and proper conclusion and its decree should be affirmed."

**A "Sand Hog" Union.**

The Compressed Air Workers of America, a recently organized union of the men who work in caissons, has resolved to ask for an increase in wages. To this end, it has drawn up an agreement to go into effect this month, and has submitted it to the contractors. The caisson workers demand an eight hour work day under ordinary conditions, with the following special schedule: Working at a depth of 55 ft., the pay to be $2.50 for eight hours; from 55 ft. to 70 ft., $2.75 for six hours; 70 ft. to 80 ft., $3 for four hours; 80 ft. to 90 ft., $3.25 for two hours; 90 ft. to 100 ft., $3 50 for one hour and twenty minutes. Double pay is demanded for overtime.

**The Comptometer.**

By a test made in the Auditor's office of the Wisconsin Central, at Milwaukee, recently, it was shown that with the "comptometer" ordinary computations can be made in one-third the time required to make them without mechanical aid. Two men were given 4,500 multiplications of four figures each, and it took them nine days. Then two men with the assistance of the comptometer took the same amount of work, and finished it in three days.

## LOCOMOTIVE BUILDING.

The Brooks Locomotive Works, of Dunkirk, N. Y., have received an order from the St. Lawrence & Adirondack for three 8-wheel locomotives.

## CAR BUILDING.

The Jackson & Woodin Manufacturing Co., Berwick, Pa., has received an order from the Philadelphia & Reading for 200 cars.

## BRIDGE BUILDING.

**Bathurst, N. B.**—Plans have been invited by the New Brunswick government for a new steel bridge across the Big River, at this place, with stone abutments.

**Brooklyn, N. Y.**—Plans for a bridge over Coney Island Creek have been approved by the Secretary of War, and the Commissioner of City Works will advertise for bids at once. The bridge is to be of the lift pattern, with a span of 50 ft. and is to cost $25,000.

**Chicago, Ill.**—Plans are being made by the Bridges Department of the Sanitary District for a swing bridge to span the drainage canal at the right of way of the Pittsburgh, Cincinnati, Chicago & St. Louis. The draw will be 400 ft. long and 112 ft. wide, and will carry 8 tracks.

**Cleveland, O.**—Bids are asked, June 16, for a 60-ft plate girder span for the north approach to the bridge to be built over the Nickel Plate Railroad. George R. Warden, Director of Public Works.

**Columbia, Pa.**—The Pennsylvania's new bridge across the Susquehanna River between here and Wrightsville has been finished and traffic was resumed over it on May 6.

**Harrisburg, Pa.**—The County Commissioners have decided to build an iron county bridge over Beaver Creek, on the Linglestown road, in West Hanover and Lower Paxton townships, bids for which will soon be asked.

An ordinance has been introduced in the Common Council providing $8,000 for an iron girder bridge 80 ft. wide, passing over all the railroad tracks at the Market street crossing. The ordinance was referred to the Streets, Sewers and Bridges Committee.

**Indianapolis, Ind.**—The Board of Works will build a steel girder bridge, estimated cost $5,000, over Pogue's Run, on South New Jersey street.

**Lowell, Mass.**—The City Engineer has been asked by the Committee on Streets to prepare estimates for a bridge across the canal opposite Aiken street.

**Madison Mill, O.**—The Fayette County Commissioners are asking bids, June 17, for a 100-ft. iron bridge across the North Fork of Paint Creek, near here.

**Montoursville, Pa.**—It is stated that the County Commissioners have given the contract for the bridge at this place to Nelson & Buchanan. Their bids were: For simple highway bridge, $10,990; for highway and trolley bridge, $13,990; for old span, $1,200.

**New York.**—On Wednesday, June 9, the Commissioners of the New East River Bridge opened the following bids for building the foundations for the Brooklyn tower:

| Name of bidder. | Lump sum to datum plane: All granite. | Lump sum to datum plane: Granite and limestone. | COMPLETED WORK BELOW DATUM, PRICE PER CUBIC YARD. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Datum to C. | | C. to D. | | D. to E. | | E. to F. | | F. to G. | |
| | | | North pier. | South pier. | North pier. | South pier. | North pier. | South pier. | North pier. | South pier. | North pier. | South pier. |
| Stevens & O'Rourke | $728,000 | $666,000 | 52 | 44 | 54 | 46 | 56 | 48 | 58 | 50 | 60 | 52 |
| C. McLean | 498,000 | 459,000 | 27 | 18 | 28 | 27 | 40 | 32 | 43 | 35 | 50 | 52 |
| Patrick H. Flynn | 675,000 | 650,000 | 35 | 25 | 40 | 35 | 45 | 40 | 50 | 50 | 55 | 50 |
| A. J. Jullock | 630,000 | 570,000 | 24 | 23 | 36 | 24 | 55 | 25 | 65 | 36 | 67 | 38 |
| Sooysmith & Co | 674,000 | 602,000 | 30 | 28 | 34 | 30 | 36 | 35 | 40 | 36 | 45 | 40 |
| Jutte & Foley Co | 577,781 | 524,468 | 21 | 18 | 50 | 21 | 30 | 25 | 45 | 35 | 50 | 45 |
| Warren-Scharf Asphalt Paving Co. | 740,000 | 662,000 | 15 | 13 | 17 | 15 | 33 | 28 | 33 | 28 | 33 | 28 |
| R. P and J. H. Staats \ T. J. Long & Co. / | 670,000 | 501,000 | 30 | 18 | 36 | 21 | 45 | 23 | 50 | 25 | 60 | 35 |
| Arthur McMullen & Co | 779,500 | 734,000 | 55 | 40 | 55 | 40 | 60 | 45 | 65 | 50 | 65 | 50 |

Bids are asked, June 14, for a bridge over Spuyten Duyvil, to connect Kingsbridge road and Broodway. C. H. T. Collis, Commissioner of Public Works.

**Niagara Falls, N. Y.**—Bids for the new 840-ft. steel arch highway bridge to be built across the gorge at this place were opened on May 27. The award has not yet been made. The Pencoyd Bridge & Construction Co. is the lowest bidder.

**St. Stanislas, Que.**—Plans are being prepared for the rebuilding of the bridge across the Batciscan River at Price's Mills.

**Plainfield, N. J.**—The freeholders of Somerset and

Union counties have decided on the cost and plans of the two new bridges to be built across Green Brook, between the city and borough. The Watchung avenue bridge is to be a concrete arch, to cost $10,000, and the Sycamore avenue structure to be a low truss plank bridge and cost $8,000.

**Reading, Pa.**—The County Commissioners have agreed to build two bridges, one in Washington, near Schultzville, and the other in Pike, near Lobachsville.

**St. Louis, Mo.**—An ordinance appropriating $6,000 for a new bridge in Forest Park has been approved by the Board of Public Improvements.

**West Albany, N. Y.**—The building of the new bridge over the tracks of the New York Central, to replace the one now at Watervliet avenue, is being considered.

**Williamsport, Pa.**—The contract for the Hepburn Township bridge has been given by the County Commissioners to the Groton Bridge & Mfg. Co., at $392, and that for the Franklin Township bridge to the Wrought Iron Bridge Co., whose bid was $430.

## RAILROAD LAW—NOTES OF DECISIONS.

### Powers, Liabilities and Regulation of Railroads.

In the Federal Court it is held that receivers operating a railroad are bound to pay out of the surplus earnings all claims contracted within a reasonable time before the receivership, for necessary repairs of a road held as part of the system, under a lease whereby payment of the interest on all outstanding bonds of such road is guaranteed; and the payment of such interest, and making permanent improvements out of surplus earnings, to the exclusion of such claims for repairs, give to the latter a superior equity to the mortgage debts.[1]

In the same Court it is laid down that the fact that, by the terms of a lease of cars to a railroad company, a portion of the rent was not due when receivers for the company were appointed, does not give a claim for that portion of the rent a preference over a mortgage on the road recorded before the making of the lease.[2]

In the same Court it is ruled that railroad receivers coming into possession of earnings of the road should pay therefrom all debts for supplies contracted within a reasonable time prior to the receivership, before spending any part in betterment of property or payment of interest on mortgage debts.[3]

In Indiana the Supreme Court holds that the statute conferring on cities power to provide "for the security and safety of citizens and other persons from the running of trains," by requiring railroad companies "to keep and maintain lights on all nights that the Common Council may direct, at a point where the railroad tracks cross a street in any city," does not authorize an ordinance requiring a railroad company to maintain a light "wherever a track of such railroad company crosses a public street in said city," without regard to whether the safety of citizens requires a light at all such points.[4]

It is also held that power conferred by the legislature upon a city to declare "what kind of lights" said companies shall maintain, but not to require any different kind from that used by the city, does not authorize a city using electric lights to require lights furnished by a railroad company to be of any particular electric pattern.

In Pennsylvania a contract between railroad companies whose roads approach their point of connection almost at right angles, so that they cannot become competitors, to interchange traffic and cars, sell coupon passenger tickets, make through bills of lading, and apportion their earnings, is not unlawful.[5]

In Illinois a railroad which allows other companies to run trains over its track is jointly liable with such other companies for injuries caused by their negligence.[6]

In Texas a railroad is chargeable with negligence of its lessee or licensee in so operating engines as to allow sparks to escape and destroy property.[7]

In New York a railroad's lease of its property is not invalid because executed pursuant to a scheme that another corporation should own the lessee's stock.[8]

### Injuries to Passengers, Employees and Strangers.

In the Federal Court it is held that whether a railroad, having provided vestibule cars for its passenger trains, was negligent in leaving, on a dark night, while the train was running rapidly, the vestibule connection between two cars without light and the outside door of the vestibule open without a guard is a question for the jury.[9]

In Georgia it is held that a railroad is liable for the act of a conductor in wantonly shooting a trespasser while driving him from the train.[10]

In Missouri the Supreme Court holds that a railroad, while running a mixed train, is answerable for damages resulting to a passenger from jumping from the train on account of the negligent and terrifying acts of one of its brakemen, made in the car in which he was being carried, and from which he might reasonably infer that a wreck of the train was imminent, though such brakeman had no express duty to perform in or about such car, or in the direction of passengers, and no real danger was imminent.[11]

In Indiana the Supreme Court rules that the duty of a porter of a sleeping car to take charge of a passenger's baggage, and to assist in removing it from the car at its destination, being under the rules and customs of the company, within the scope of the porter's employment, he is not to be regarded as a mere gratuitous bailee.[12]

In Utah, where a rule of a railroad company that employees shall not attempt to uncouple moving cars has long been habitually disobeyed, with the company's knowledge, without an attempt by it to enforce the rule, an employee, in disobeying the rule, is not guilty of contributory negligence as a matter of law.[13]

And it is held that where the negligence of the employer and that of a fellow-servant combine to produce an injury to a servant, the employer is liable.

In Texas, plaintiff, who had been employed with others in repairing defendant's railroad bridge, was set to work at another place; and, on resuming work at the bridge several days afterward, he stepped on a plank which had been laid by the workmen over the ends of the ties during his absence, but had not yet been nailed. The Supreme Court holds that the negligence, if any, was not in laying the plank, but in allowing it to remain unfastened; and, as this was an act of negligence continuing after plaintiff had again become a fellow-servant of the other workmen, he could not recover—the act of 1891, relating to fellow-servants, being then in force.[14]

In Massachusetts the Supreme Court holds that where one employed to inspect cars and make couplings goes between the cars for the purpose of making a coupling, without giving notice of his presence there to his foreman or the persons in charge of the engine, and is caught by the backing of the cars, he is chargeable with negligence.[15]

In Utah the fact that a switchman knew that a defective engine, requiring considerable attention, was being operated by an engineer without a fireman, did not preclude, on the ground of assumption of risk, a recovery for injuries received by him because of the engineer's failure to observe his signals, as a result of the extra duties imposed on the engineer.[16]

In Nebraska, the Supreme Court rules that where a laborer on a railroad attempted to board a construction train which he had been assisting in loading, and which it was not his duty to accompany after the train was in motion, upon a sudden command of the master to do so, he was not guilty of contributory negligence as a matter of law, though there was danger apparent to him in the attempt to obey the order.[17]

In Texas it is held that a brakeman whose attention is directed to his duty of coupling cars at a place where a weighing platform is maintained by consent of the railroad company, and who is injured by striking his foot against a plank projecting above the surface of the platform, is not negligent in failing to observe the defect, of the existence of which he had no previous knowledge.[18]

In the Federal Court it is laid down that a railroad is only required to use reasonable care in examining a foreign car coming into its yards, and is not under a duty to examine it with "sufficient care" to ascertain whether it is in safe condition for use by its employees.[19]

In the Federal Court it is held that a railroad is not bound to any act or service in anticipation of trespassers on its track, nor is the engineer obliged to look out for them; and a trespasser venturing upon the track for purposes of his own assumes all risk of conditions which may be found there, including the operation of engines and cars.[20]

In Georgia, it is laid down that where a railroad for a long time kept smooth a space between its tracks, extending from one street to another, in a much-frequented part of the town, which was continuously used by the public as a footway, though its only purpose in doing so was to enable its passengers to safely alight from and board its trains, there was an implied license or invitation to the public to pass over the space; hence the company was liable to one who, though not a passenger, was injured by stepping at night, without negligence on his part, into a hole dug in such space by the company and negligently left unguarded.[21]

In the same state it is ruled that the fact that a railroad permitted children to enter its yard to carry meals to their fathers, who were employed by the road, does not render it liable for injuries to a child who suddenly darted beneath a car after a ball thrown by a playmate immediately before the car was started, where it does not appear that the servants who started the car knew, or were in a position to discover, that the child was under the car, and there was a safe way for the child to pass.[22]

[1] So. Ry. v. Tillett, 76 Fed. Rep., 507.
[2] M. H. S. v. Anderson, 76 Fed. Rep., 164.
[3] So. Ry. v. Carnegie (C. C. A.), 76 Fed. Rep., 492.
[4] Shelbyville v. C. C., C. & St. L., 44 N. E. Rep., 929.
[5] C. Val. v. G. & H., 35 Atl. Rep., 952.
[6] C. & E. v. Meech, 45 N. E. Rep., 290.
[7] G., H. & H. v. Burnett, 37 S. W. Rep., 779.
[8] Flynn v. B. C., 41 N. Y. S., 466.
[9] Bronson v. Oakes, 76 Fed. Rep., 734.
[10] Higgins v. So. Ry., 25 S. E. Rep., 837.
[11] Ephland v. M. P., 37 S. W. Rep., 820.
[12] Voss v. Wagner, 44 N. E. Rep., 1010.
[13] Wright v. South. Pac. (Utah), 46 Pac. Rep., 374.
[14] Allen v. G. H. & S. A., 37 S. W. Rep., 171.
[15] Nihill v. N. Y., N. H. & H., 44 N. E. Rep., 1075.
[16] Wright v. So. Pac., 46 Pac. Rep., 374.
[17] C., R. I. & P. v. McCarty, 68 N. W. Rep., 633.
[18] G., C. & S. F. v. Hockaday, 37 S. W. Rep., 475.
[19] Atchison, T. & S. F. v. Meyers (C. C. A.), 76 F., 443.
[20] Sheehan v. St. P. & D., 76 Fed. Rep., 201.
[21] Burton v. W. & A., 25 S. E. Rep., 736.
[22] S. F. & W. v. Walker, 25 S. E. Rep., 823.

## MEETINGS AND ANNOUNCEMENTS.

### Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

*Boston & Lowell*, semi-annual, 4 per cent., payable July 1.

*Chicago & Eastern Illinois*, quarterly, 1½ per cent. on preferred stock, payable July 1.

*Chicago & Northwestern*, 2¼ per cent. on common stock and quarterly of 1¾ per cent. on preferred stock, both payable July 6.

*Manhattan*, quarterly, 1 per cent., payable July 1.

*New York & Harlem*, 4 per cent., payable July 1.

*Oregon Railroad & Navigation Co.*, 1 per cent. on preferred stock, payable July 1.

*Buffalo Railway Co.*, quarterly, 1 per cent., payable June 15.

*Chicago City*, quarterly, 3 per cent., payable June 30.

### Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

*New York, Lake Erie & Western Coal & Railroad Co.*, annual, Bradford, Pa., June 14.

*Northern of New Jersey*, annual, Englewood, N. J., June 16.

*Oregon Railway & Navigation Co.*, annual, Portland, Or., June 21.

### Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *American Railway Master Mechanics' Association* will hold its annual convention at Old Point Comfort, Va., beginning June 15, 1897.

The *National Association of Car Service Managers* will hold a convention at Boston, Mass., on June 16, 1897.

The *Train Despatchers' Association of America* will hold its tenth annual convention at Detroit, Mich., on June 22, 1897.

The *American Society of Railroad Superintendents* will hold its next meeting at Nashville, Tenn., beginning Sept. 22.

The *American Society of Civil Engineers* meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month, at 8 p. m.

The *American Street Railway Association* will hold its sixteenth annual convention in Convention Hall, Niagara Falls, Oct. 19–22, 1897.

The *Association of Engineers of Virginia* holds in formal meetings on the third Wednesday of each month, from September to May, inclusive, at 710 Terry Building, Roanoke, at 8 p. m.

The *Association of Railway Telegraph Superintendents* will hold a convention at Niagara Falls, N. Y., on June 16, 1897.

The *Boston Society of Civil Engineers* meets at 715 Tremont Temple, Boston, on the third Wednesday in each month, at 7:30 p. m.

The *Canadian Society of Civil Engineers* meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday, at 8 p. m.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, N. Y., on the second Friday of January, March, May, September and November, at 2 p. m.

The *Civil Engineers' Club of Cleveland* meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month, at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

The *Civil Engineers' Society of St. Paul* meets on the first Monday of each month, except June, July, August and September.

The *Denver Society of Civil Engineers* meets at 3 Jacobson Block, Denver, Col., on the second Tuesday of each month except during July and August.

The *Engineering Association of the South* meets on the second Thursday in each month, at 8 p. m. The Association headquarters are at The Cumberland Publishing House, Nashville, Tenn.

The *Engineers' and Architects' Association of Southern California* meets each third Wednesday of the month in the Hall of the Chamber of Commerce, Los Angeles, Cal.

The *Engineers and Architects' Club of Louisville* meets in the Norton Building, Fourth avenue and Jefferson street, on the second Thursday each month at 8 p. m.

The *Engineers' Club of Cincinnati* meets at the rooms of the Literary Club, No. 25 East Eighth street, Cincinnati, O., on the third Thursday in each month, at 7:30 p. m. Address P. O. Box 333.

The *Engineers' Club of Columbus, (O.)*, meets at 12½ North High street, on the first and third Saturdays from September to June.

The *Engineers' Club of Minneapolis* meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

The *Engineers' Club of Philadelphia* meets at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month, at 8 p. m., except during July and August.

The *Engineers' Club of St. Louis* meets in the Missouri Historical Society Building, corner Sixteenth street and Lucas place, St. Louis, on the first and third Wednesdays in each month.

The *Engineers' Society of Western New York* holds regular meetings the first Monday in each month, except in the months of July and August, at the Buffalo Library Building.

The *Engineers' Society of Western Pennsylvania* meets at 410 Penn avenue, Pittsburgh, Pa., on the third Tuesday in each month, at 7:30 p. m.

The *Montana Society of Civil Engineers* meets at Helena, Mont., on the third Saturday in each month, at 7.30 p. m.

The *New England Railroad Club* meets at Wesleyan Hall, Bromfield street, Boston, Mass., on the second Tuesday of each month.

The *New York Railroad Club* meets at 12 West Thirty-first street, New York City, on the third Thursday in each month, at 8 p. m.

The *North-West Railway Club* meets on the first Tuesday after the second Monday in each month, at 8 p. m., the place of meeting alternating between the West Hotel, Minneapolis, and the Ryan Hotel, St. Paul.

The *Northwestern Track and Bridge Association* meets at the St. Paul Union Station on the Friday following the second Wednesday of March, June, September and December, at 2.30 p. m.

The *Ohio State Tramway Association* will hold its next meeting at Columbus, O., on June 15.

The *Railway Signalling Club* will meet on the second Tuesday of the months of January, March, May, September and November, in Chicago.

The *St. Louis Railway Club* holds its regular meeting on the second Friday of each month, at 3 p. m.

The *Southern and Southwestern Railway Club* meets at the Kimball House, Atlanta, Ga., on the third Thursday in January, April, August and November.

The *Technical Society of the Pacific Coast* meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m.

The *Western Foundrymen's Association* meets in the Great Northern Hotel, Chicago, on the third Wednesday of each month. A. Sorge, Jr., 1533 Marquette Building, Chicago, is secretary.

The *Western Railway Club* meets in Chicago on the third Tuesday of each month, at 2 p. m.

The *Western Society of Engineers* meets in its rooms on the first Wednesday of each month, at 8 p. m., to hear reports, and for the reading and discussion of papers. The headquarters of the Society are at 1736–1739 Monadnock Block, Chicago.

### Engineers' Society of Western New York.

A regular monthly meeting of the Engineers' Society of Western New York was held in the Buffalo Library, Buffalo, N. Y., on Monday, June 7, at 8 p. m. A paper giving a historical sketch of the water supply of Buffalo was read by Mr. E. B. Guthrie. The next regular meeting of the society will be held in September.

### Engineers' Club of St. Louis.

A meeting of the society was held at 1600 Lucas Place at 8 p. m. June 2, with President Flad in the chair. Thirty-one members and three visitors were present. The paper of the evening, by Prof. W. K. Hatt, of Lafayette, Ind., entitled "Notes on the Location of Mountain Railways," was then read. The general problems to be overcome in the location of mountain railroads were first set forth and numerous examples of their solutions were cited. The writer described the Swiss roads and exhibited plans, section and lantern slides showing views along the lines. Rack and cable railroads for mountain service were also described and illustrated. A large number of views were shown of the Callao-Lima Railway of Peru, which reaches the highest point and exhibits the most difficult construction of any in the world. After a general discussion of the paper by Messrs. Crosby, Ockerson, Harrington and Hermann, the meeting adjourned to the library, where lunch was served.

### Engineers' Club of Cincinnati.

At the regular meeting held on May 20, Paul Starrott, Superintendent of Construction of the new Union Passenger Station being erected at Columbus, O., by the Cleveland, Cincinnati, Chicago & St. Louis and the Pittsburgh, Cincinnati, Chicago & St. Louis railroad companies, entertained the club with a description of the work under his charge, illustrating his lecture with stereopticon views. In addition to the passenger depot proper, which is nearing completion, there is being constructed at the same time and as a part of the improvement, a viaduct spanning the tracks at the locality, which serves as an approach to the depot, and which is lined with buildings serving as a screen for the tracks and yards of the railroad companies, this being a re-

quirement of the city in the arrangement made with it for the work. Shops for the railroad companies are also being built under the same contract with the rest of the work. The approximate cost of the entire work when complete will be over half a million dollars.

**American Institute of Mining Engineers.**

As already announced, the next meeting of the Institute will be held in the Lake Superior region, with an excursion to the Black Hills, South Dakota. Replies indicate a large attendance of members (and some 50 ladies). It has therefore been possible to secure very reasonable rates and an extremely attractive programme is promised. The steamer North West, leaving Buffalo July 9, Cleveland and Detroit July 10, will stop at Houghton. It will carry a special party under charge of Mr. David T Day, United States Geological Survey, Washington, D. C. All correspondence concerning steamer accommodations should be addressed to him. An approximate estimate of the total expense of the trip from Buffalo and return (not, however, including the excursion to the Black Hills), with all accommodations, is $75 for the 12 days. Sessions will be held on board the steamer from Buffalo and at Houghton and Duluth. The local programme will include visits to the Lake copper mines, to the attractions at Duluth, the ore docks at West Superior and Two Harbors, and trips to the Vermilion and Mesabi iron ranges. Those members who can are urged to make the trip to the Black Hills, where a very strong effort is being made to welcome and entertain the visiting members and guests. Few localities offer so wide a range of interest in so small an area and which can be inspected with so little effort or discomfort.

**Engineers' Club of Philadelphia.**

The stated meeting of the club, held May 15, was called to order by President Joseph T. Richards at 8:15 p. m., 41 members and visitors being present. The President directed the Secretary to read the House Bill entitled "To Regulate the Height of Buildings in Cities of the First Class." In connection with the bill, Mr. John Birkinbine thought that the law regulating the height of buildings should be based not only on the present width of streets, but also on the future conditions of buildings in the neighborhood. The Club as a body took no formal action on the bill in approval or disapproval of its passage. The Club then proceeded with the discussion of the question, "Modern High Office Buildings." Mr. James Christie spoke at some length in regard to the construction of such buildings and of the strength of columns which should be used in their construction. He further pointed out that the partitions, if well planned, can become important braces. They should generally be of the cellular web construction. Mr. Arthur Falkenau dwelt upon the question of suitable foundations and Mr. E. M. Nichols spoke in particular in regard to the settlement of foundations due to the uneven character of different soils. Prof. W. L. Webb, Messrs. J. T. Richards, E. F. Miller, C. L. Eglin, J. S. Merritt and H. V. Loss also took part in the discussion.

A business meeting of the club was held on June 5, and Messrs. Theodore N. Ely, Philadelphia, and Frank L. Sheppard, Altoona, Pa., were elected members. The following papers were presented: "The Bertrand-Thiel Modification of the Open Hearth Process," by Mr. J. S. Robeson; "Rainfall and Stream-Flow Observations in Eastern Pennsylvania," by Mr. John E. Codman.

## PERSONAL.

—Mr. J. E. Crosland, Jr., has been appointed General Agent of the Charleston & Western Carolina, with headquarters at Atlanta, Ga.

—Mr. H. Bronner has been appointed Assistant Treasurer of the St. Joseph & Grand Island, with office at 28 Broad street, New York City.

—Mr. R. H Heard has been appointed Traveling Freight Agent of the Chicago Great Western, with headquarters at St. Paul, Minn.

—Mr. W. E. Coman has been appointed General Agent of the Oregon Railroad & Navigation Co., at Butte, Mont., to succeed Mr. E. S. Blair, resigned.

—Messrs. Milton Bryan, Henry Day and R. H. M. Davidson were nominated on June 2 by Governor Bloxham to be Florida Railroad Commissioners.

—Mr. John A. Kerwin, Roadmaster of the Chicago & Northwestern, between Madison and Milwaukee, Wis., with headquarters at Madison, has resigned.

—Mr. Frederick D. Buskirk has been appointed General Agent of the Ohio Southern and Detroit & Lima Northern, with headquarters at Cincinnati, O.

—Mr. M. E. Kinsley has been appointed Traveling Freight Agent of the Great Northern, with headquarters at Buffalo, N. Y., to succeed Mr. H. S. Noble.

—Mr. George B. Ecker, Soliciting Agent of the Atlantic Coast Line at Tarboro, N. C., has been transferred to Atlanta, Ga., to succeed Mr. S. B. Stringfellow.

—Mr. Charles M. Heald has been elected President of the Chicago & West Michigan Mr. Heald will retain his present office of General Manager of the company.

—Mr. G. D. Abbott has been appointed Superintendent and Secretary of the Eureka & Palisade, with office at Eureka, Nev., to succeed Mr. D. J. Colton, resigned.

—Mr. J. H. Hamilton has been appointed Superintendent of the Ohio River Railroad, with office at Parkersburgh, W. Va. The appointment took effect June 1.

—Messrs. Charles Macdonald, George S. Greene, Jr., and Theodore Cooper were elected members of the Chamber of Commerce of the State of New York on June 3, 1897.

—Mr. Charles Hammond has been appointed Roadmaster of the Missouri, Kansas & Texas, of Texas, with headquarters at Trinity, Tex., to succeed Mr. T. J. Powers, resigned.

—Mr. D R. Peck, formerly connected with the Erie Dispatch, in Cleveland, has been appointed Traveling Freight Agent for the Northern Steamship Co., with headquarters in Cleveland.

—Mr. S. M. Hill has been appointed Traveling Passenger Agent of the Cleveland, Cincinnati, Chicago & St. Louis, with headquarters at Cairo, Ill., to succeed Mr. C. L. Hilleary, promoted.

—Mr. J. T. Davis has been appointed Auditor and General Freight and Passenger Agent of the South Georgia, with headquarters at Quitman, Ga., to succeed Mr. M. R. Meadows, resigned.

—Mr. J. J. Hess, Division Roadmaster of the Gulf, Colorada & Santa Fe, with headquarters at Cleburne, Tex., has resigned to accept a similar position with the Great Northern, at St. Paul, Minn.

—Mr. C. W. Nelson has been appointed General Freight Agent of the Galveston, La Porte & Houston, to succeed Mr. C. F. Byers, resigned. Mr. Nelson will retain his present office of Auditor and General Passenger Agent.

—Mr. H. T. Hoag has been appointed General Freight and Passenger Agent and Auditor of Traffic Accounts of the Poughkeepsie & Eastern, with headquarters at Poughkeepsie, N. Y., to succeed Mr. W. H. Seeley, resigned.

—Mr J. E. Cates has been appointed Traveling Freight and Passenger Agent of the Mexican National, with headquarters at 353 Broadway, New York City, to succeed Mr. O. F. Spindler, assigned to other duties with the same company.

—Mr Sanford L. Parrott, formerly in the Passenger Department of the Memphis & Charleston, at Memphis, Tenn., has been appointed Traveling Passenger Agent of that road, with headquarters at Atlanta, Ga., to succeed Mr. E. E. Everett.

—Mr. George Eighmy, Jr., formerly Assistant City Ticket Agent of the Lake Shore & Michigan Southern, at Buffalo, N. Y., has been appointed Traveling Passenger Agent of the Great Northern and of the Northern Steamship Co., with headquarters at Buffalo.

—Mr. Silvanus S. Riker died at his home in New York City on June 6. Mr. Riker was elected President of the Washington & Georgetown Railroad in 1874 and held that office for several years. At the time of his death he was a Director of the Third Avenue Railroad of New York City.

—Mr. S. M. Felton has been appointed Receiver of the Columbus, Sandusky & Hocking by Judge Taft in the U. S. Circuit Court at Cincinnati, O. Mr. Felton is now President and Receiver of the Cincinnati, New Orleans & Texas Pacific and is one of the Receivers of the Kentucky & Indiana Bridge Co.

—Mr. A. S. Dodge, Vice-Chairman of the Southwestern Traffic Association, has been appointed General Traffic Manager of the St Louis Southwestern. Mr. Dodge formerly held the same position, but resigned in 1886, when he was appointed to represent the road in the Southwestern Traffic Association,

—Mr. A. J. De Russy died at Abilene, Tex., on May 30, of consumption. Mr. De Russy was born in New Orleans in 1867. He entered railroad service with the Texas & Pacific in 1885, and remained with that company up to the time of his death He was appointed General Freight Agent in New Orleans in 1895, but during the early part of the present year, on account of ill health, he went to El Paso, Tex., from which place he afterward removed to Abilene.

—Mr. Joseph Richardson died at his home in New York City on June 8, aged 84. Mr. Richardson was at one time engaged in a considerable contracting work, having built a section of the Union Pacific and portions of the Missouri Pacific, the St. Louis, Iron Mountain & Southern and Mexican Central railroads. He also built the annex to the Grand Central Station in New York City. At the time of his death he was connected with the Safety Car Heating and Lighting Co., and was a stockholder in the New York, New Haven & Hartford and the Manhattan Elevated Railway Co.

—There has just died at Fernhill, Alderley Edge, Cheshire, England, Mr. John Ramsbottom, the distinguished predecessor of Mr. F. W. Webb, and one of the important figures in the railroad history of England. Mr. Ramsbottom was born in 1814, and was Locomotive Superintendent of the Manchester & Birmingham, and its successor, the London & North Western, for many years, beginning in 1842. He was known, says the *Engineer*, as one of the "Stephenson lot" and made many inventions in the railroad mechanical world. He succeeded Mr. Francis Trevithick at the head of the Crewe Works in 1857, and made the large extensions which converted those shops into a city. He was the designer of the Waverley class of locomotives, of which the "Lady of the Lake" was a well-known example. Ramsbottom invented the track tank for delivering water to locomotives in motion, and it was first used on the London & North Western. For many years that company was the only one in England using it, the invention being generally adopted in this country earlier than in its home. Mr. Ramsbottom retained the post of Consulting Engineer to the London & North Western down to the time of his death, and was President of the Institution of Mechanical Engineers.

—Mr. Charles Benjamin Brush died at his home in New York City, June 3. Mr. Brush was born in New York in 1848 and was educated at the New York University, receiving the degree of Civil Engineer. He was a member and Past Director and Vice-President of the Am. Soc. C. E. He was also a member of the Am. Soc of Mechanical Engineers; of the Colonial Club and of the Engineers' Club, having served as a director and Vice-President of the latter. For a good many years he was Professor of Civil Engineering in the University of the City of New York, and received from it the degree of Doctor of Civil Engineering. He was Chief Engineer of the Hackensack Water Co., the Queens County Water Co., and the Hoboken Land Improvement Co. He had acted as Consulting Engineer of the Washington bridge, as Chief Engineer of the North Hudson County Railroad, the Hoboken Ferry Co., and the Kansas City Water Co. Besides these positions he had for years done much important consulting work.

Mr. Brush was a man of great attainments professionally and his work and his habit of thought were marked by extraordinary clearness, precision and simplicity of method. His business ability and judgment were equal to his skill as an engineer; he was possessed of a high order of executive ability, was quick to decide, usually correct in his conclusions and while alert, keen and progressive was yet duly conservative. Furthermore, he was a man of of more than usual rectitude and resolution, and was tolerant of the opinions of others and modest as to his own opinions. Mr. Brush was as powerful physically as intellectually—a prodigious worker and he somewhat sadly remarked early in his serious illness, "I have been quickly successful, but is the game worth the candle?" All of these qualities combined to give him a high place in the profession and in the personal esteem of those whose who knew him well. Furthermore, he was a man of public spirit and interested in public and private charity, doing his work in these matters as well as in his profession in a quiet and efficient way. Altogether, his death, which had been expected for two or three years, leaves a serious gap in the profession and in the circle of his personal friends and acquaintances.

## ELECTIONS AND APPOINTMENTS.

*Atlanta, Knoxville & Northern.*—J. A. Pride having resigned the office of General Agent to accept service elsewhere, that office has been abolished. J. H. McWilliams has been appointed Traveling Freight and Passenger Agent, with office at Knoxville, Tenn. N. H. Brown has been appointed Superintendent, with office at Marietta, Ga. The office of Car Accountant has been abolished.

*Atlantic & Lake Superior.*—At a recent meeting of the directors, held in Montreal, the following officers and directors were elected: President, J. R. Thibaudeau; First Vice-President, Senator Owens; Second Vice-President, V. W. Larue; directors, Henry Hogan, R. Prefontaine, James Baker, Rudolphe Audette, George Ball, Charles Chaput, R. A. D. Fleming and L. H. de Friesse.

*Baltimore & Potomac.*—At the annual meeting of the stockholders of this road (the Washington, D. C., line of the Pennsylvania), held recently at Baltimore, Md., the following officers and directors were elected: President, Benjamin F. Newcomer; First Vice-President, Charles E. Pugh; Second Vice-President, William J. Sewell; Treasurer, Robert W. Smith; Secretary, James P. Kerr; Directors, Charles E. Pugh, R. D. Barclay, John Cassels, Robert C. Hall, Samuel Cox, Jr., Michael Jenkins and John B. Ramsay.

*Barre.*—At the annual meeting of the stockholders, held at Barre, Vt., on May 27, the present Board of Directors was re-elected. Officers were then elected as follows: President, A. D. Morse; Vice-President and General Manager, William A. Stowell; Clerk and Treasurer, F. W. Stanyan; Executive Committee, W. A. Stowell, A. D. Morse and E. L. Smith.

*Boston & New York Air Line.*—At the annual meeting of stockholders held at New Haven on June 1, the present Board of Directors was re-elected, with the exception that E. Hayes Trowbridge was elected to succeed the late Henry B Hammond. The Directors then elected officers as follows: President, John M. Hall; Vice President, E. Hayes Trowbridge; Secretary, W. E. Barnett; Treasurer, W. L. Squire. The road constitutes the Air Line division of the New York, New Haven & Hartford.

*Burlington & Lamoille.*—At a meeting of the directors, held on June 3, the following officers were elected for the ensuing year: President, D. D. Ranlett, St. Albans, Vt.; Treasurer, L. H. Bixby, Montpelier; Clerk, George T. Childs, St. Albans.

*Chattanooga, Rome & Columbus.*—H. C. Knox, Traveling Freight Agent, has been transferred from Nashville, Tenn., to Chattanooga, Tenn., and the general agency at Chattanooga has been discontinued.

*Chicago & Eastern Illinois.*—At the annual meeting of the stockholders held at Chicago, June 2, the present officers and Board of Directors were re-elected without change.

*Chicago & Northwestern.*—At the annual meeting of stockholders held in Chicago June 3, the following directors were elected for three years: David P. Kimball, Chauncey M. Depew, Samuel F. Barger, Albert Keep, M. L. Sykes and James C. Fargo. The present officers of the company were re-elected.

*Chicago, Rock Island & Pacific.*—At the annual meeting of stockholders, held at Chicago on June 2, the following Directors whose terms had expired were re-elected: H. R. Bishop, Alexander E. Orr, R. R. Cable and Warren G. Purdy. Ogden Mills, of New York, was elected a Director, to succeed Alexander T. Van Nest, deceased. Officers were re-elected as follows: President, R. R. Cable; First Vice President, Benjamin Brewster; Second Vice-President, Secretary and Treasurer, W. G. Purdy; Third Vice-President, W. H. Truesdale.

*Columbia, Sandusky & Hocking.*—Receiver Felton has removed J. S. Beale, General Passenger Agent, and has appointed W. W. Daniel General Freight and Passenger Agent. Mr. Daniel was formerly General Freight Agent.

*International & Great Northern.*—The offices of Superintendent of Car Service, held by E. C. Manson, and Purchasing Agent, held by W. E. Williams, have been abolished and the duties of those offices will hereafter be performed by Assistant General Superintendent George L. Noble. E. O. Griffin, formerly Assistant to the General Manager, has been appointed Chief Clerk to the Assistant General Superintendent.

*Louisville & Nashville.*—W. E. Bryan, formerly City Ticket Agent, has been appointed City Passenger Agent at Louisville, Ky., to succeed C. C. W. Altriend, deceased. W. J. Ruffner has been appointed City Ticket Agent, to succeed Mr. Bryan.

*Louisville, Henderson & St. Louis.*—C. H. Jones has been appointed Western Passenger Agent, with headquarters at St. Louis. B. L. Bryant has been appointed Traveling Passenger Agent, with headquarters at Louisville.

*Minneapolis, St. Paul & Sault Ste. Marie.*—At the annual meeting of stockholders, held at Minneapolis on June 1, the present officers and Board of Directors were re-elected without change.

*Norfolk & Western.*—The office of Division Freight Agent of the Western General Division has been abolished and the jurisdiction of W. E. Mingea, Division Freight Agent, Roanoke, Va., has been extended over all divisions, except the Scioto Valley, Durham and Winston-Salem divisions.

*Northern (N. H.).*—At the annual meeting of stockholders held at Concord, N. H., on May 27, the following Directors were elected: A. W. Sulloway, J. H. Benton, Jr., Silas Pierce, U. H. Crocker, Dexter Richards, William F. Thayer and B. P. Creney. The road is leased to the Boston & Maine.

*Pennsylvania Co.*—At the annual meeting of stockholders, held at Pittsburgh on June 1, the following directors were elected for the ensuing year: Frank Thomson, James McCrea, J. T. Brooks, John E. Davidson, Joseph Woods, John F. Green, William H. Barnes, N. P. Shortridge, Charles E. Pugh, Samuel Rea, George Wood, C. S. Patterson and William Stewart.

*St. Louis, Chicago & St. Paul.*—At a meeting of the directors of the reorganized company, held at Springfield, Ill., on May 29, officers were elected as follows: President, Charles E. Kimball, 27 Pine street, New York City; Vice-President, Joseph Dickson, St. Louis, Mo; General Manager, Henry W. Gays, St. Louis, Mo.; Secretary and Treasurer, Ralph Blaisdell, Springfield, Ill. The following changes and appointments took effect on June 1: Ralph Blaisdell, appointed Auditor, with office at Springfield, Ill.; C. Millard, appointed Superintendent and Engineer, with office at Sprinfield, Ill., to succeed W. S. Cooke, Superintendent, resigned; C. W. Galligan,

appointed Assistant General Freight Agent, with office at St. Louis, Mo.; E. A. Williams, appointed Assistant General Passenger Agent, with office at St. Louis, Mo.; D C. Frederick, appointed Car Service Agent, with office at Springfield, Ill.; W. E. Killen, appointed Master Mechanic, with office at Jerseyville, Ill.

*San Antonio & Arkansas Pass.*—J. C. Mangham has been appointed Assistant General Freight Agent and George F. Lupton, Assistant General Passenger Agent, both with headquarters at San Antonio, Tex.

*Seaboard Air Line.*—J. A. Pride has been appointed Soliciting Freight Agent, with office at Spartanburg, S. C., to succeed J. N. Wright, previously Soliciting Freight Agent at Laurens, S. C. S. B. Stringfellow has been appointed Soliciting Freight Agent at Atlanta, Ga.

*Southern.*—W. H. Bennett has been appointed Soliciting Agent, with office at Richmond, Va., to succeed C. D. Boyd. W. G. Boyd has been appointed Soliciting Agent, with office at 271 Broadway, New York City, to succeed Charles Barham.

*Southern Pacific.*—Charles E. Wermuth has been appointed Assistant Auditor, Atlantic System. G. R. Cottingham has been appointed Auditor of the New York, Texas & Mexican and of the Gulf, Western Texas & Pacific, with headquarters at Victoria, Tex., to succeed J. L. Boyle.

*Unadilla Valley.*—At the annual meeting of stockholders held recently in New York City, the following officers were elected: President, Frederic de Coppet; Vice-President, Ralph Brandreth; General Manager, Frederic F. Culver; Treasurer, G. C. Henry; Secretary, Clarence Goadby.

*Union Pacific.*—The office of General Agent, Passenger Department, at both Des Moines and Sioux City, Ia., formerly held by George E. Abbott, has been abolished, and Mr. Abbott has been appointed City Passenger and Ticket Agent at Omaha, Neb., to succeed A. C. Dunn. Herbert M. Birdsall has been appointed City Ticket and Passenger Agent at Sioux City.

*Wabash.*—R. F. Kelley, heretofore New York State Passenger Agent at Buffalo, is now Division Passenger Agent in the same city, the trains of the Wabash being now run through to Buffalo over the Grand Trunk and the Erie.

*Williamsport & North Branch.*—At a meeting of the directors, held in Williamsport on June 4, the resignation of H. C. McCormick as President was accepted. The following officers were elected: Vice-President, George V. Forman; Treasurer, J. H. Cochran; Secretary, S. T. McCormick; General Manager, R. E. Eavenson.

## RAILROAD CONSTRUCTION, Incorporations, Surveys, Etc.

**Astoria & Columbia River.**—Orders have been given to Messrs. Honeyman, DeHart & Glenn, of Portland, Or., the general contractors for this road, to complete the line to Goble by Oct. 1. A force of 500 men is now employed on the road, which force is to be considerably increased within a few days. The road is to extend from Astoria, Or., east to Goble about 46 miles with a branch from Astoria south to Seaside. Connection with the Northern Pacific can be had at Goble.

**Atlantic & Lake Superior.**—In accordance with a decision arrived at a recent meeting of the directors a force of men has been put at work on the incompleted portion of the Baie des Chaleurs Division between Coplin, its present terminus, and Gaspè, about 115 miles. The work, which is to be pushed from both ends at the same time, is under the direct supervision of Mr. James Shanley, Chief Engineer, who has been on the line for some time past making the necessary preparations. On June 1 the company again assumed control of the Baie des Chaleurs, which has been operated since last summer by the Dominion Government as a branch of the Intercolonial. The names of the officers recently elected are given in another column.

**Canada Atlantic.**—A bill has been approved by the Government, providing for an extension of this road from the present eastern terminus at Lacolle, St. John County, Que., to points on the northern boundaries of New York State and Vermont, crossing the Richelieu River by a bridge at Lacolle. Five years are given for the completion of this work, and the company is authorized to issue bonds to the extent of $25,000 per mile. The road now extends from Ottawa east 138 miles to Lacolle. E. J. Chamberlin, Ottawa, Ont., is General Manager.

**Chicago & Northern Pacific.**—A second track is now being laid on the line between Blue Island and McCook, Ill., 14 miles, and about half of the work has been completed. The A. S. C. E. standard 70-lb. rails are being used. This portion of the line is used for freight service only.

**Colorado Valley.**—The contract for building this road from Colorado, Tex., a point on the Texas & Pacific, southeast to San Angelo, Tex., the terminus of the Gulf, Colorado & Santa Fe, has been given to the Toledo Construction Co., of Toledo, O. The road will be 75 miles long and will pass through Robert Lee, Coke County, Tex. The city of San Angelo has voted to subscribe $40,000 cash and $10,000 in property toward building the road, 15 per cent. to be paid on the completion of the first five miles and 15 per cent. for each additional five miles until 25 miles are built, the remaining 25 per cent. to be paid when the road is completed. W. Wheatcroft, Robert Lee, Tex., is General Manager.

**Duluth & Iron Range.**—A contract has been given to W. E. Dorwin to build an extension from Biwabik, Minn., west about 2½ miles to the Roberts mines near McKinley. It is expected that the work will be done this summer. The road extends from Duluth in a general northerly direction into the Mesaba and Vermilion Iron Ranges.

**Georgia & Alabama.**—The extension of the Fitzgerald Division, from Fitzgerald south to Ocilla, Ga., 8 miles, has been completed, and the line was opened to the public June 1. The Fitzgerald Division formerly extended from Abbeville, in Southern Georgia, south 23 miles to Fitzgerald.

**Inter Mountain.**—Surveys are now being made for this proposed road from Boulder, Col., northeast 15 miles to Ward and Spring Gulch, and it is announced that contracts for grading will be let as soon as the survey has been completed. The road will be used for ore and coal transportation from the mines of Boulder County. E. C. Thompson, of Meadville, Pa., Vice-President of the company, is in the field directing the survey.

**Mississippi River, Hamburg & Western.**—This company was incorporated in Arkansas on June 3, with a capital stock of $500,000, by James M. Parker and E. K. Devereux, of Cripple Creek, Col., and W. P. McConley and Z. T. Hedges, of Hamburg, Ark. It is proposed to build a road from Hamburg east to a point on the Mississippi River, about 50 miles.

**Mobile & Ohio.**—The contract for furnishing the ties and and for track-laying on the extension of this road from Columbus, Miss., to Montgomery, Ala., which was formerly given to Gianini & Co., and afterward relinquished by that company, has been let to McCabe & Steen. Grading is being pushed rapidly, but principally at the Columbus end, where it reached the Alabama state line on June 1. Watkins & Hardaway, contractors for the bridges, have 100 men at work near Tuscaloosa quarrying stone for bridge piers. It is now expected that the entire extension will be completed this year.

**Norfolk, Virginia Beach & Southern.**—The main line of this road, which extends from Norfolk, Va., 18 miles, east to Virginia Beach, has been made standard gage. The work was completed, and regular train service over the new track was begun on May 29. The road connects at Norfolk with the Norfolk & Western and other railroads.

**Oxford County.**—This company has recently been organized in Maine to build a railroad from a point on the Grand Trunk near Woodstock, Oxford County, Me., north through Milton Plantation, Rumford, Peru and Mexico to an intersection and connection with the Rumford Falls & Rangeley Lakes, a total of about 25 miles. A branch is also proposed, leaving the main line about two miles west of Rumford, thence northeast across the Androscoggin River to Andover. The capital stock of the company is to be $150,000.

**Pennsylvania Co.**—A branch line, to be known as the Beaver Dam Valley Branch, of the Cleveland & Pittsburgh, is being built from New Philadelphia, O., to the mines of the East Goshen Coal Co., a distance of 5 miles. The work was begun on May 10 and track-laying is now nearly completed. The work is light, with no heavy grading or important bridging.

**Richmond, Blackstone & Southern.**—The charter of this company has been secured by Petersburgh capitalists, who propose to build a road in a direct line from Ridgeway, N. C., northeast to Richmond, Va., passing through Blackstone, Va., a distance of about 90 miles. A charter was granted to this company with very broad provisions by the Virginia Legislature some years ago.

**San Francisco & San Joaquin Valley.**—The southern extension of this road from Fresno, Cal., to Bakersfield has been completed to Hanford, 28 miles, and on May 23 the first train was run over the new line from Fresno, carrying officials of the road and invited guests. This portion of the road has been built by Grant Brothers, of San Francisco. Surveys for the entire line to Bakersfield have been made, and it is proposed to push construction work toward that place from Hanford as rapidly as possible. Grading has already been begun south of Hanford.

**Sedalia, Marshall & Miami.**—A preliminary survey of this proposed road in Missouri has been made by J. E. House, Chief Engineer of the company, assisted by C. H. Zell, and it is proposed to begin the final survey within a few days. The line will extend from Sedalia north about 45 miles to Miami, Saline County, on the Missouri River, passing through Marshall.

**Waco & Sabine Pass.**—The survey of this proposed road in Texas has been completed from Waco southeast to the Leon County line, 61 miles, where it will cross the International & Great Northern. Profiles, maps, estimates, etc., are now being prepared for this portion of the line. The remainder of the line to Sabine Pass will be surveyed as soon as the preliminary reconnaissance can be made. R. P. Duncan, Vice-President and General Manager, states that grading will be begun as soon as the surveys have all been finished. The capital stock of the company is $250,000.

## Electric Railroad Construction.

**Baltimore.**—The Central Railway Co. has been granted permission to lay tracks on some of the streets in East Baltimore.

**Buffalo, N. Y.**—Contracts have been let for the work on the first 15 miles of new line to be built by the Buffalo Traction Co. this summer. The plans were approved on May 28 by the Board of Public Works, and construction work has already been begun.

**Camillus, N. Y.**—The Marcellus Electric Railroad Co. has been incorporated, with a capital stock of $60,000, to build an electric road from Camillus to Marcellus, a distance of 2½ miles. The directors include T. K. Cheney and H. M. Fordham.

**Chicago.**—The Chicago, Blue Island & Harvey Railroad Co. has been granted a franchise to build 3 miles of electric road on Western avenue, between Blue Island and Harvey. The company will be required to light the right of way and to pave the road from curb to curb when the gross receipts reach $7,000 a mile. The capital stock of the company is $250,000 in $100 shares. Among the stockholders are William H. David and R. E. Jones.

**Cleveland, O.**—Mr. Thomas F. Walsh, General Manager of the Akron & Cuyahoga Falls Rapid Transit Co., informs us that work will be begun as soon as consents can be secured on the extensions to Ravenna on the east and to Doylestown, Wayne County, on the west. Additional tracks will also be laid in Akron. The line now runs between Kent, Cuyahoga Falls, Akron and Barberton.

**Haddonfield, N. J.**—The Camden & Suburban Railroad Co. has accepted the ordinance recently passed by the Haddonfield Borough Commissioners, and it is said that work on the new road will commence next week and be completed within six months in accordance with the provisions of the ordinance.

**Hartford, Conn.**—The track work has been finished on the electric trolley road to run from New Britain to Hartford. The overhead construction has not yet been completed, but work is in progress along the entire route and the road may be ready for service within a month.

**Hoboken, N. J.**—The double-track electric road on Washington street has been completed, and cars will be placed in operation between the ferries at First and Fourteenth streets within a few days.

**London, Ont.**—The London Street Railway Co. will be extended to Pottersburg.

**Marietta, O.**—Our correspondent informs us that New York parties guarantee the money needed to build the line from Marietta to Williamson, and down the West Virginia side of the Ohio River to Parkersburgh, 12 miles. Negotiations are now under way for the purchase of the necessary property at Parkersburgh.

**Oneonta, N. Y.**—The Oneonta & Otego Valley Railway Co. filed articles of incorporation for a road running from Oneonta to West Oneonta, a distance of 10 miles. The new company has secured the franchises of the Oneonta Street Railway Co. Capital stock, $100,000.

**Ottawa, Ont.**—The Ottawa Electric Railway Co. is seeking power from Parliament to borrow $500,000 to pay the cost of extensions and improvements.

**Pittsburgh, Pa.**—The Sheridan & Elliott extension of the West End Traction line has been completed and was put in operation the middle of this week.

**Port Jervis, N. Y.**—The officers of the company which proposes to build an electric road in Port Jervis last week asked that their franchise, which required them to build 4 miles of road this year, be changed so as to require the building of but 2½ miles. The trustees refused to alter the wording of the franchise. On account of this action it is thought that no work will at present be attempted.

**Reading, Pa.**—The Reading Traction Co. has given $6,500 for right of way over a half-mile of the Perkiomen & Reading turnpike.

**Rensselaerville, N. Y.**—The Greenbush & Nassau Electric Railroad Co. has applied for a franchise to build an electric road in Rensselaerville.

**St. George (S. I.), N. Y.**—The Midland Railroad has asked for a franchise to build a line on Hyatt street, St. George, and also to double track the Cove Road. The Board has granted the latter franchise.

**Toledo, O.**—The right of way has been secured for nearly the entire distance for an electric road between Toledo and Genoa. The projectors have in view the extension of this line from Genoa to Woodville, thence to Fremont. The capital has not yet been secured for the construction of the road.

**Westfield, Mass.**—Right of way has been granted for an electric road 2 miles in length in Westfield. The rails have already been bought and contracts will be let in about three weeks.

**West Newton, Pa.**—The West Newton Passenger Street Railway Co. has accepted the borough ordinance requiring the company to build two tracks on Second avenue from the borough line to Vine street and have cars running within one year.

## GENERAL RAILROAD NEWS.

**Canadian Pacific.**—The earnings for April and for the four months ended April 30 have been reported as follows:

| | 1897. | 1896. | Inc. or Dec. |
|---|---|---|---|
| *April:* | | | |
| Gross earn | $1,617 859 | $1 455,906 | I. $161,953 |
| Oper. expen | 99 ,742 | 934,676 | I. 26,066 |
| Net earn | $527,117 | $491,230 | I. $135,887 |
| *Four months:* | | | |
| Gross earn | $5,731,822 | $6,759,563 | D. $1,027,741 |
| Oper. expen | 3,8?3,326 | 4,962,120 | D. 1,138,794 |
| Net earn | $1,9?8,496 | $1,797,443 | I. $111,053 |

**Centralia & Chester.**—Judge Allen, of the U. S. Circuit Court at Springfield, Ill., has appointed a receiver for this road on the application of the Missouri Car & Foundry Co., of St. Louis. The company is represented as being insolvent, with unpaid claims and judgments amounting to about $135,000. The road extends from Evansville, Ill., northeast to Centralia, Ill., 61.5 miles.

**Chicago & Northwestern.**—The earnings for the year ending May 31 have been reported as follows:

| | 1?97. | 1896. | Inc. or Dec. |
|---|---|---|---|
| Gross earn | $31,980,255 | $33,488 761 | D. $2,508,576 |
| Oper. expen | 18,882,811 | 20 373 4?2 | D. 1,490,591 |
| Net earn | $12,097,444 | $13,115,359 | D. $1,017 915 |
| Taxes | 1,?58,379 | 1,675,568 | D. 17,189 |
| Balance | $11 039,065 | $12 039,791 | D. $1,?00,726 |
| Inc. on bonds | 6,490,519 | 6,708 616 | D. 218,107 |
| Balance | $4,548,546 | $5,331,165 | D. $782,619 |
| Sinking funds | 196,412 | 220,990 | D. 24,578 |
| Total net | $4,352,134 | $5,110 175 | D. $?58,041 |
| Other income | 336,790 | 257,909 | I. ?8,881 |
| Total income | $4 683,924 | $5,368,084 | D. $679,160 |
| Dividends | 3 518,650 | 3,517,057 | I. 1,593 |
| Surplus | $1,170,274 | $1,851,027 | D. $68 ,753 |

The charges to operating expenses for maintenance of way and structures amount to $4,126,486, an increase over preceding year of $109,053.

**Chicago Terminal Transfer Co.**—Articles of incorporation of this company were filed at Springfield, Ill., on June 4. This is a reorganization of the Chicago & Northern Pacific, a synopsis of the plan for which was given in these columns on May 14. The charter provides for acquiring the property of the Chicago & Northern Pacific and also for building the following new lines: One from Chicago West to the Mississippi River; another from Chicago to East St. Louis; another from Chicago to a point on the Ohio River, and another from Chicago to a point on the Indiana and Illinois boundary line, via Kankakee. The capital stock of the new company is $30,000,000. The incorporators and first Board of Directors are: William Allen Butler, Jr., Yonkers, N. Y.; Charles H. Coster, Tuxedo, N. Y.; Fred T. Gates, Montclair, N. J.; Edward Adams, Henry Budge, Alfred S. Heidelbach, and Colgate Hoyt, New York City; Samuel Rainslie, Kemper K. Knapp, Henry S. Hawley, Edward S. Harson, Frederick E. Paradis, Edward R. Knowlton, Mark Breedin, Jr., and William S. Mailette, all of Chicago.

**Columbus, Sandusky & Hocking.**—Upon the application of the Reorganization Committee Judge Taft in the U. S. Circuit Court at Cincinnati, O., appointed Samuel M. Felton Receiver for this company on June 1. The suit was based on the non-payment of the interest, due April 1, on $700,000 of 5 per cent. bonds issued in November, 1895. This is the third time that the company has been in a receiver's hands. The Columbus, Sandusky & Hocking was a consolidation, on Dec. 23, 1893, of the Columbus, Shawnee & Hocking and the Sandusky & Columbus Short Line. A receiver was ap-

pointed on June 28, 1895, and the property was sold under foreclosure on Oct. 19 of that year, being purchased for $1,500,000 on behalf of the bondholders. On Jan. 16, 1897, a receiver was appointed without notice, but was discharged the following week and a court order was issued restraing further applications for a receiver without notice to the company. Gen. Louis Fitzgerald is Chairman of the Reorganization Committee, at whose request Mr. Felton was appointed Receiver. The road extends from Sandusky to Shawnee, O., 199 miles, with various short branches.

**Evansville & Richmond.**—A reorganization of the company has been effected and articles of incorporation of the new company, which bears the same name, were filed with the Secretary of State of Indiana on May 27. The capital stock is $1,500,000. The incorporators, who are also named as directors, are George B. Wilson, Joseph B. Yerkes, William H. Clark, J. R. Taylor and W. S. Whitney. The road, which extends from Elnora, Ind., east to Westport, Ind., 101.4 miles, was sold under foreclosure at Washington, Ind., on March 23, and the property was bought in by the Farmers' Loan & Trust Co. of New York for $1,413,712.80.

**Hendersonville & Brevard.**—Judge Norwood, of the North Carolina Superior Court for Henderson County, has ordered this road sold on July 5 to satisfy judgments amounting to $90,000 secured by creditors against the company. The contractor who built the road claimed $60,000 of this amount, which, it is said, will be paid first, being a first lien on the property. T. C. McNeely was appointed Receiver by Judge Dick, of the United States Circuit Court at Greensboro, N. C., on Dec. 23 last. The road is 22 miles long and extends from Hendersonville, N. C., on the Southern Railway, to Brevard, Transylvania County. No upset price was fixed by the Court.

**Middle & East Tennessee Central.**—This road was sold at Gallatin, Tenn., on May 31 in consequence of a decree entered in the Chancery Court in the case of Thomas H. King, trustee for the bonds, against the company, to foreclose a mortgage of $150,000. It was bought by Joseph & Bros., of Cincinnati, O., for $10,000 cash. The road was originally projected to extend from Gallatin to Knoxville, 165 miles, but only the section between Rogona, Tenn., and Hartsville, 12 miles, has been built.

**Mobile & Ohio.**—The suit against this company, which was brought in the Supreme Court in New York City, by Reuben Leland, one of the stockholders, last April, has been discontinued. The suit was brought to set aside the contract for building the extension from Montgomery, Ala., to Columbus, Miss., and the issue of $4,000,000 bonds to provide for its construction. The defendant parties named in the complaint were the Farmers' Loan & Trust Co., the Central Trust Co. as the trustee for the new mortgage, Hallgarten & Co. and Joseph W. Woolfolk, the contractor. The withdrawal of this action will now permit the sale of the $4,000,000 of bonds by Hallgarten & Co.

**Nashville, Chattanooga & St. Louis.**—The suit which was brought against this road and the Louisville & Nashville by J. S. Rogers to annul the lease of the Tennessee Midland and the Paducah, Tennessee & Alabama made to this road by the Louisville & Nashville Jan. 1, 1896, has been dismissed by Judge Clark at Nashville on demurrer. Mr. Rogers, who is said to be the largest individual stockholder of this company, claimed that the roads leased were not earning charges and could only be a burden on the company.

**Norfolk & Western.**—The earnings for April and for the seven months ended April 30 were as follows:

| | 1897. | 1896. | Inc. or Dec. |
|---|---|---|---|
| *April:* | | | |
| Gross earn | $799,949 | $938,195 | D. $138,246 |
| Oper. expen | 603,324 | 797,431 | D. 194,107 |
| Net earn | $196,625 | $140,764 | I. $55,861 |
| *Seven months:* | | | |
| Gross earn | $6,170,003 | $6,583,941 | D. $413,938 |
| Oper. expen | 4,439,997 | 5,181,503 | D. 741,506 |
| Net earn | $1,730,006 | $1,402,438 | I. $327,568 |

**Northeastern of Georgia.**—Governor Atkinson, of Georgia, who took formal possession of this road on May 6 last, has advertised it for sale on June 21. Sealed bids will be received up to that date. The upset price is $287,000, the amount of the state bonds on the road. The road extends from Athens north to Lula, Ga., 140 miles.

**Ohio Valley.**—The sale of this road, which was to have taken place on June 3, has been postponed to July 6, on petition of a number of the stockholders. The upset price will be $1,050,000, and a deposit of $100,000 will be required from all bidders. The sale will take place at Henderson, Ky.

**Peoria, Decatur & Evansville.**—The committee of which W. A. White is Chairman, which was appointed in 1894 to protect the interest of the first mortgage bondholders, both on the main line and on the Evansville Division, states that it considers the proposition recently made by the second mortgage bondholders' committee for a plan of reorganization inadvisable for the first mortgage bondholders to accept, and asks the latter to deposit their bonds under the agreement by which the committee was appointed, with the Atlantic Trust Co. of New York City. A brief account of the proposition made by the second mortgage bondholders was given in these columns last week.

**Quincy, Omaha & Kansas City.**—This road, which was sold under foreclosure at Chicago on April 23 and purchased by a committee representing the bondholders for $300,000, has been reorganized under the same name, and articles of incorporation of the new company were filed in Missouri on June 1. The capital stock of the new company is $1,500,000, and among the incorporators are J. McD. Trimble, C. A. Braley, F. B. Wilcox and A. L. Carson.

**Western Union Telegraph.**—Messrs. J. P. Morgan & Co., have bought $2,000,000 of the capital stock of this company, the proceeds to be applied to the liquidation of the floating debt and to new construction work. The new issue will form an addition to the 953,700 shares (par value $95,370,000) already issued and listed, and is a part of the $13,800,000 of increased stock authorized by the stockholders on Oct. 12, 1892.

## Electric Railroad News.

**Albany, N. Y.**—The stockholders of the Albany Railway Co. have voted to issue bonds and to mortgage the property to the amount of $250,000.

**Baltimore, Md.**—The Columbia & Maryland Railway Co. has recorded two mortgages for $3,000,000 each as security for an issue of $6,000,000 five per cent. 50-year bonds, the proceeds of which are to be used to finish the electric road between Baltimore and Washington and to pay the indebtedness of the Catonsville Construction Co., which abandoned the work last year.

**Boston.**—The Boston & Newton Street Railway Co. has asked for an additional $125,000 to be added to its capital stock.

The Wellesley & Boston Street Railway Co. has petitioned the Railroad Commissioners for an increase of capital stock from $40,000 to $100,000. A hearing will be given June 22.

The Senate has passed the Boston Elevated Railroad bill and it will now go to the House for concurrent action on minor amendments.

**Chicago.**—Judge Showalter has authorized Receiver McKeon, of the Calumet Electric Street Railway Co., to issue $200,000 of Receiver's certificates. They are to bear 6 per cent. interest and will be redeemable at any time upon notice. As stated among our notes May 21, $185,000 is needed for immediate use.

**New York.**—The Court of Appeals on June 8 rendered a decision that permanently enjoins the Third Avenue Railroad from completing its Kingsbridge road. The subject has been considered at some length among the scrap notes in this issue.

**Pittsburgh, Pa.**—The deal by which all the North Side electric lines are to be consolidated with the Second Avenue Traction Co. under the title of the Union Traction Co. has been practically consummated. The stockholders of the Pittsburgh, Allegheny & Manchester Traction Co., the last to be included in the deal, will vote this week on a proposition to sell the 60,000 shares of stock (par value $30) to Alex. Brown & Son, Baltimore, for $41 per share, $25 in cash and $16 in 5 per cent. bonds on the Union Traction Co.

**Syracuse, N. Y.**—The Syracuse & Suburban Railroad Co. has increased its capital stock from $250,000 to $400,000. The road was granted a charter in June, 1895.

## TRAFFIC.

### Traffic Notes.

The "Henderson Route" has been established between St Louis and Louisville, over the Louisville & Nashville and the St. Louis, Henderson & St. Louis. There will be two passenger trains each way daily.

The Railroad Commissioners of South Dakota have prepared freight and passenger tariffs, according to the new law of that state, and propose to put them into effect on July 1. Hearings will be held on June 17 and subsequent days.

The Traders' Live Stock Exchange, of Kansas City, Mo., is the defendant in a suit brought by the United States District Attorney, under the anti-trust law, to compel the Exchange to cease discrimination in the use of its buying and selling facilities. Press dispatches seem to indicate that this concern has no connection with the Kansas City Live Stock Exchange and is of comparatively small importance.

It is announced that sleeping cars will be run through between Chicago and Portland, Or., over the Chicago & Northwestern, the Union Pacific and the Southern Pacific, by way of Ogden and Sacramento. The establishment of this line is said to be a consequence of the severance of the intimate relations hitherto existing between the Union Pacific and the Oregon Short Line, the latter road having been the Union Pacific's line to Portland ever since it was built. The new management of the O. S. L. has recently made a traffic agreement with the Rio Grande Western and it seems to be understood that its through business to the East will hereafter be sent through Salt Lake City as much as possible.

The Railroad Commissioners of Texas have issued to the railroad companies of that state a circular stating that they hear that cut rates have been established on freight from the East to Texas points; and whereas, they believe that reductions will be made from St. Louis also; and whereas they are required to protect the people and railroads in Texas against the evil effects of rate wars, and so forth, they warn the railroads that any such interstate reduction will be met by an order from the Commission reducing rates in Texas on all lines that participate in the reduced interstate rates. It would appear that a Texas road which refrains from reducing rates from distant points will be allowed to continue its present rates within the state—and lose the business.

### A Merchants' Conference on Pooling.

The meeting at Cincinnati, June 8, called by E. P. Wilson and others, to discuss the subject of railroad pooling legislation was a large one. Delegates were present from the freight bureaus of New York, Chicago, Philadelphia, Boston, Louisville, Indianapolis, St. Louis, Omaha, Kansas City, Savannah, Denver, Milwaukee, St. Paul, Memphis, Richmond, Charleston, Baltimore and New Orleans. There was some divergence of opinion as to the form of the legislation, but according to press despatches reports were presented from 2,100 organizations of shippers favoring pooling legislation.

At the afternoon session a permanent organization was perfected as follows: Chairman, John A. Garo, Cincinnati; Secretary, Napoleon B. Kelly, Philadelphia; Committee on Resolutions, E. P. Wilson, Chairman; William Coates, F. B. Thurber, D. G. Purse, A. J. Vanlandingham, H. F. Druseman and F. A. Scott.

After a general discussion of the Foraker and Cullom bills and the Senate substitute for the Foraker bill, the whole matter was referred to the committee on resolutions. This committee was unable to draft its report, but reported the import of its findings to the full conference and the same was agreed to.

The Senate substitute was agreed to, together with the recommendations in the report of the Senate Committee on Commerce, with the following additional amendments:

First, the elimination of the imprisonment clause and the substitution in addition to the $5,000 penalty for the first offense a penalty of three times the amount of the freight charge against corporations violating the law.

Second, to make all agreements authorized between railroads subject to the same provisions that are stipulated for pooling itself.

Third, to authorize aggrieved shippers to sue for damages incurred through the use of private cars as instrumentalities of discrimination.

Fourth, for the punishment of railroad companies for using private cars in any manner of discrimination.

Fifth, providing that when the Interstate Commerce Commission has made its report and has ordered reparation by which a change back to an original rate is ordered, it must specify the rate and also the rate to which it is ordered to return.

Sixth, a national uniform classification.

A resolution was adopted asking each of the organizations represented to take immediate action upon the recommendations of the committee and report such action to their Senators and Representative in Congress.

No name was given the assemblage. It was adjourned *sine die*. The Freight Commissioners subsequently met to organize a National Association of Freight Commissioners.

### The B. & O. and the Joint Traffic Association.

The principal result of the meeting of the Board of Control of the Joint Traffic Association on May 13, it will be remembered, was the appointment of Messrs. Depew, of the New York Central, and Thomson, of the Pennsylvania, as a committee to "labor with" the Receivers of the Baltimore & Ohio, who had been reported to be cutting rates. The meeting brought out allegations that "two of the strongest roads" had also been cutting rates, so that to some people it looked as though the conference was to be an experience meeting exclusively. Whether it was or was not, we shall never know, but one of the conferees, Mr. John K. Cowen, one of the Receivers, has given to the newspapers a partial report of the meeting as follows:

"Mr. Murray and myself had an exceedingly pleasant interview with Messrs. Thomson and Depew. There was no pretense by any one present that any of the railroads out of New York were maintaining rates, with the single exception of the Delaware, Lackawanna & Western. The pretense that the Baltimore & Ohio is acting differently from other roads is one of the persistent humbugs which has been resolutely and constantly published, and for which there is not the slightest foundation in truth. We stated that we were not only desirous of maintaining rates absolutely, but, in our judgment, the Baltimore & Ohio had nothing to gain by cutting rates, and everything to gain by maintaining them if all our competitors did likewise.

"After considerable discussion we made two propositions—first, that the Baltimore & Ohio would absolutely maintain rates without deviation of a hair, with no evasion, direct or indirect; that from June 1 we would agree that President E. B. Thomas, of the Erie, should absolutely take such steps as he should deem necessary, in order to secure the maintenance of rates by all lines, and we would cheerfully comply with his orders, whatever they might be, if other lines would do the same. We were willing to give to Mr. Thomas autocratic power over our traffic and our rates and abide by his decisions if other lines would do the same.

"After a friendly discussion, our proposition was not accepted. We at once made a second proposition. This was that we would absolutely maintain the rates if other lines would do the same, and confine our business to a fixed percentage of New York traffic, as named by us in the proposition, and this was at once accepted by Messrs. Thomson and Depew. This ended the interview, which was friendly throughout, and there was not the slightest intimation that the Baltimore & Ohio was being forced in any particular.

"With regard to the statement that the old percentage agreement has been in force it is sufficient to say that it has never been observed; that no attempt has been made to even up percentages, nor have the various companies made efforts to comply with the awards. There is no one who would go further than myself to confer authority, law or no law, upon some capable man to enforce the maintenance of rates."

### Chicago Traffic Matters.

CHICAGO, June 9, 1897.

The Interstate Commerce Commission has held investigations in this city six days. The first case taken up was the lumber differential matter known as the Eau Claire case; the Commission has taken it under advisement, and will probably make a new ruling. In the complaint of the Texas Cattle Shipping Association against the roads delivering cattle to the Union Stock Yards, the complaint was on the $2 switching charge. The American Warehousemen's Association desired to secure an order prohibiting the railroads from giving free storage of grain, sugar and other goods beyond a reasonable time. Evidence was taken, but the case was continued. The Commission began its hearing into the charges of discrimination in grain rates by the Eastern roads on Saturday, and yesterday morning began taking further testimony regarding them. This part of the investigation will probably last the rest of the week.

As a result of various reductions put in by some of the Western roads from Kansas City to small and unimportant meetings in the East, Western roads have now all cut the round-trip rate Kansas City to Chicago to $12.50.

The Chicago-St. Paul passenger situation continues to be a disturbing element in the Western Passenger Association. Rates quoted by brokers show that the rate from St. Paul and Minneapolis to Chicago is cut $1.50, to St. Louis, $2; to Kansas City, $1.50, and to Denver, $3, mostly by way of the Wisconsin Central, the Minneapolis & St. Louis and the Chicago Great Western. Conditions as regards party business are in bad shape. The Chicago Great Western road has made a rate of $8 for the round trip Chicago to St. Paul and return for the University team, which consisted of 15 men and about five or six outsiders. The Soo line has placed on sale round-trip tickets for the home-going school teachers to Montreal, New York, Portland and Boston, making a rate of $30.50, good going June 11, 12 and 13, and returning until Sept. 1.

Eastbound shipments from Chicago and Chicago Junctions to points at and beyond the Western termini of the trunk lines for the week ending June 3 amounted to 52,952 tons, as compared with 50,556 tons the preceding week. This statement includes 20,460 tons of grain, 2,079 tons of flour and 10,203 tons of provisions, but not live stock. The following is the statement in detail for the two weeks:

| Roads. | Week Ending June 3. | | Week Ending May 27. | |
|---|---|---|---|---|
| | Tons. | p. c. | Tons. | p. c. |
| Baltimore & Ohio | 4,046 | 7.6 | 4,919 | 9 7 |
| C., C., C. & St. Louis | 2,987 | 5 6 | 3,274 | 6 5 |
| Erie | 6,126 | 11.6 | 4,854 | 9.6 |
| Grand Trunk | 4,215 | 7 9 | 4,952 | 9 8 |
| L. S. & M. S | 4,959 | 9 4 | 6,351 | 12.6 |
| Michigan Central | 8,571 | 16 2 | 7,490 | 14.8 |
| N. Y., Chi. & St. L | 4,910 | 9.3 | 4,892 | 9.7 |
| Pitts., Cin., Chi. & St. Louis | 4,938 | 9 3 | 4,457 | 8 8 |
| Pitts., Ft. Wayne & Chicago | 6,813 | 12 9 | 6,596 | 13 0 |
| Wabash | 5,387 | 10.2 | 2,771 | 5.5 |
| Totals | 52,952 | 100.0 | 50,556 | 100.0 |

Lake shipments last week were 93,963 tons.